GLOBAL MEDICAL & HEALTH COMMUNICATION

Global Medical & Health Communication

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Global Medical & Health Communication

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The submitted manuscript must be the article that has never been published, and the author must ensure that all co-authors have agreed by signing a statement on the seal. Download template of the ethical statement (free plagiarism) here. The manuscript is an original article free from plagiarism. When the article published in another journal then in the next journal, the article will be disallowed.

All articles will be discussed by experts in the field of scholarly concerned (peer reviewer) and will be edited by the editor. The editor reserves the right to add or subtract sentences, both abstracts, and scripts without changing the meaning. Manuscripts that accepted for publication will become the property of the publisher. It is not allowed to be published in other media. The needed revised manuscripts will be returned to the author. Research articles must be approved by the health research ethics committee or consider the ethical aspects of research accounted for

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Table title is the typed center, font size 10 pt, bold, initial letter of each word written with capital letter, except conjunctions. The titles are numbered and written on top of the table. Example: Table 3 *Neisseria gonorrhoeae* Resistance to 8 Types of Antimicrobials in 20 Specimens. Table, no vertical dividing line, and there are only three horizontal borderlines. Created tables in sequence two spaces from the text. Table descriptions and abbreviations are placed in the table description, not on the table title.

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The article contains results of original research in the field of basic medical or applied, and health. The article format consists of Title & Abstract (English) and *Judul* & *Abstrak* (Indonesian), Introduction, Methods, Results, Discussion, Conclusion(s), Conflict of Interest, Acknowledgments, and References.

Articles Title

Maximum article title consists of 12 words (choose words and terms that are dense meaning and able to characterize the entire contents of the script). Typed with bold fonts, size 12 pt, one space, the initial letter of each word is written in capital letters (except the conjunctive), and center. The ownership row consists of 2 elements, the author name and origin institution. Author's name written with the initial fonts are capital and bold, size 11 pt, one space, and center. Institution name written with the initial fonts are capital, size 10 pt, one space, and center.

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The abstract is typed using 12 pt font size and one spaces. The abstract is written in one paragraph, one space, maximum 250 words, and should describes the entire contents of the article. The abstract should be suitable for the format of introduction, methods (contain method, place, and time of study), results, and discussion. Abstract be equipped with key words consisting of 3–5 words.

Introduction

The introduction is written succinctly to stimulate the reader's interest include all the necessary information. At the end of the introduction was written the purpose of the study.

Methods

Methods contains the material under study, and the way described briefly by the order of operation as well as the location and time of the study. Explain statistical methods in detail. Consideration of ethical issues is included. If the protocol has been approved then the ethical clearance/approval letter number and the health research ethics committee must be written.

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The result is the core of scientific writing. This section presents data and information that will be used as

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Discussion
Discussion of the article reveals, explains, and discusses the results of the study with an analysis by the research design, interpretation, and explanation of its synthesis. Also, the results obtained are compared with the results of previous research of others.

Conclusion(s)
The conclusion is submitted by the results obtained by the researcher and written briefly and clearly in two or three sentences.

Conflict of Interest
All authors must make a formal statement at the time of submission indicating any potential conflict of interest that might constitute an embarrassment to any of the authors if it were not to be declared and were to emerge after publication. Such conflicts might include, but are not limited to, shareholding in or receipt of a grant or consultancy fee from a company whose product features in the submitted manuscript or which manufactures a competing product.

Acknowledgement
Acknowledgments should be provided to research contributors without writing a degree.

References
References are written by the Vancouver system's writing rules, given the sequence number corresponding to appearing in the article. List all author names if no more than six people; when more than six authors write the first six authors followed by et al. The references cited in the article are the most important references. The minimum referral number of 25 (twenty-five) copies of the most recent 10 (ten) years of journal article/book publishing. Reference should be sought from 80% primary literature and 20% secondary literature. Avoid referral in the form of personal communication except for information that is not possible from a public source. Include source name, date of communication, written permission, and confirmation of the accuracy of the source of communication.

Example How to Write References
Journals
Theodoridou K, Vasilopoulou VA, Katsiaflaka A, Theodoridou MN, Roka V, Rachiotis G, et al. Association of treatment for bacterial meningitis with the development of sequelae. Intern J Infect Dis. 2013;17(9):e707–13.

Zhang B, Kunde D, Tristram S. Haemophilus haemolyticus is infrequently misidentified as Haemophilus influenzae in diagnostic specimens in Australia. Diagn Microbiol Infect Dis. 2014;80(4):272–3.

Books and Other Monographs
Editor as Author
Nriagu J, editor. Encyclopedia of enviromental health. Michigan: Elsevier BV; 2011.

Organization as Author
World Health Organization (WHO). Guideline: neonatal vitamin A supplementation. Geneva: WHO Press; 2011.

Chapter in Book
Miller LG. Community-associated methicillin resistant Staphylococcus aureus. In: Weber JT, editor. Antimicrobial resistance. Beyond the breakpoint. Basel: Karger; 2010. p. 1–20.

Conference Proceeding
Nicholai T. Homeopathy. Proceedings of the Workshop Alternative Medicines; 2011 November 30; Brussels Belgium. Belgium: ENVI; 2011.

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King P. Haemophilus influenzae and the lung (Haemophilus and the lung). Clin Transl Med. 2012;1:10 [cited 2015 August 15]. Available from: https://clintransmed.springeropen.com/articles/10.1186/2001-1326-1-10.

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RESEARCH ARTICLE

Effects of Android-Based *Sayang ke Buah Hati* (SEHATI) Application towards Mothers' Knowledge and Children's Skill on Hand Washing with Soap

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Abstract

Hand washing with soap is the most straightforward skill that elementary school-aged children should have to avoid infectious disease transmission. Rapid development of today's technology has led to efforts to develop android-based applications for smartphones to improve health-related knowledge. *Sayang ke Buah Hati* (SEHATI) application is an android-based application for improving mother's knowledge on health-related issues. The objective of this study was to analyze the effects of SEHATI application in improving mothers' knowledge regarding hand washing and the relationship between mothers' knowledge and children's skills improvement in hand washing with soap. This was a quasi-experimental study with pretest-posttest one group design conducted in the period of February to March 2017 on 33 mothers and students of grades 1 and 2 of Uchuwwatul Islam Elementary School in Bandung city who met the inclusion criteria, not met exclusion criteria, and are willing to participate as respondents. Knowledge data were analyzed using paired t test while skill data were analyzed using Spearman rho. Results showed that SEHATI application improved mothers' knowledge on hand washing with soap (p<0.001). A relationship was observed between mothers' knowledge and improved children's skill in hand washing with soap (p<0.001). It is concluded that SEHATI application can be used as a guide for parents to find health-related information, which improves mother's knowledge on hand washing with soap and indirectly improves children's skill in hand washing with soap..

Key words: Knowledge, SEHATI application, skill, washing hands

Pengaruh Aplikasi Sayang ke Buah Hati (SEHATI) Berbasis Android terhadap Pengetahuan Ibu dan Keterampilan Anak tentang Cuci Tangan Pakai Sabun

Abstrak

Mencuci tangan menggunakan sabun merupakan keterampilan paling sederhana yang harus dimiliki anak usia sekolah dasar untuk mencegah penyakit menular. Perkembangan teknologi yang berkembang pesat saat ini merupakan salah satu upaya meningkatkan pengetahuan ibu, yaitu dengan memanfaatkan aplikasi Sayang ke Buah Hati (SEHATI) yang tersimpan dalam *smartphone* android. Tujuan penelitian menganalisis pengaruh penerapan aplikasi SEHATI berbasis android pada ibu terhadap peningkatan pengetahuan tentang cuci tangan pakai sabun dan hubungan antara pengetahuan ibu dan keterampilan anak tentang cuci tangan pakai sabun. Penelitian menggunakan metode *quasi-experiment* dengan *pretest-posttest one group design*. Subjek penelitian adalah 33 ibu dan anak kelas 1 dan 2 SD Uchuwwatul Islam di Kota Bandung yang telah memenuhi kriteria inklusi dan tidak termasuk kriteria eksklusi serta bersedia menjadi responden. Penelitian ini dilakukan pada bulan Februari sampai Maret 2017. Analisis data pengetahuan menggunakan uji t berpasangan, sedangkan analisis data keterampilan menggunakan Spearman ro. Hasil penelitian menunjukkan bahwa aplikasi SEHATI meningkatkan pengetahuan ibu tentang cuci tangan pakai sabun (p<0,001). Terdapat hubungan antara pengetahuan ibu dan keterampilan anak tentang cuci tangan pakai sabun (p<0,001). Simpulan, aplikasi SEHATI dapat digunakan sebagai panduan orangtua dalam mencari informasi kesehatan yang mampu meningkatkan pengetahuan ibu serta berdampak pada keterampilan anak tentang cuci tangan pakai sabun.

Kata kunci: Aplikasi SEHATI, cuci tangan, keterampilan, pengetahuan

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Introduction

Hand washing with soap is the most straightforward skill the elementary school-age children must have to prevent infectious diseases such as diarrhea, pneumonia, respiratory infections, intestinal worms, measles, etc.[1,2] Infectious diseases are considered to be a significant contributor to global morbidity and mortality in children. School-age children (5–14 years) in Indonesia contribute 1.9% of deaths caused by infectious diseases.[3] The 2013 Basic Health Research reported that the prevalence of infectious diseases such as intestinal worms, measles, and typhoid among elementary school children is still quite high.[4]

Elementary school is the most appropriate period to teach hand washing with soap skill. Perceptions and habits obtained at this stage can lay the foundation for lifelong health practices that determine the children's quality of life in the future.[5,6] Hand washing with soap skill of elementary school-age children is still problematic. A study in Indonesia show that 71.8% of elementary school children do not wash their hands properly.[7] This result is supported by the 2013 Basic Health Research (BHR) report that shows correct hand washing behavior as the third lowest indicator out of the ten indicators of clean and healthy living behavior with the proportion of 47.0% nationally and 45.7% in West Java Province for children aged ≥10 years.[4]

Elementary school-aged children need guidance and support in applying daily hand washing skills. At this age stage, children are still unable to wash their hand regularly and voluntarily without reminders from family or parents. Parents are the closest people to children and they, especially the mother, are the most appropriate persons to teach children to was their hands using soap.[6] The ability of mothers to teach children to wash their hands using soap is greatly influenced by the level of knowledge they own.[8] This has been stated in a study in Nigeria which explains that mothers who have good knowledge have a stronger ability to motivate children to practice hand washing when compared to mothers with less knowledge who tend to believe that hand washing cannot prevent disease transmission so as not to motivate children to practice it.[9]

Health education is one of the efforts to increase one's knowledge. The media used in health education activities will influence the process of one's understanding of gaining knowledge.[10,11] Audiovisual media offers a more exciting and non-monotonous method by displaying motion, images, and sound.[12] Smartphones are currently widely used as a medium for health education in health services because they are portable, easy to carry, available in wide range, and can present information personnally. The most widely used operating system for smartphones to date is the Android operating system.[13] Various types of applications are provided by android smartphones including applications on health.[14,15] The use of mobile health (mHealth) and smartphone applications has been proven to be effective as an information media for health education which may lead to changes in a person's knowledge and skills.[16]

The authors, supported by the study team, has developed a prototype of a health education expert system for smartphones in the form of an android-based application under the name of Love Your Children or *Sayang ke Buah Hati* (SEHATI). This is an audiovisual media with moving images or animations, attractive colors, and a time/reminder system that provide health information on hygienic and healthy living behavior, including fruits and vegetables consumption, physical activities, hand washing with soap, and proper tootbrushing for elementary school children. The purpose of this study was to analyze the effect of the android-based SEHATI application on mothers' knowledge on hand washing with soap and the relationship between mother's knowledge and child's skill in hand washing with soap..

Methods

This was a quasi-experimental analytical study with pretest-posttest one group design on 33 mothers and children in grade 1 and 2 of Uchuwwatul Islam Elementary School in Bandung city who met the inclusion and exclusion criteria and were willing to participate in the study which was evident by the signing of the consent form. Sampling was performed using purposive sampling. The independent variables of this study were media (SEHATI application) and mother's knowledge on hand washing with soap after using SEHATI application, while the dependent variables were mothers' knowledge and children's skill on hand washing with soap after the mother used SEHATI application. Assessment of mothers' knowledge on handwashing with soap was assessed using a questionnaire and the scoring was performed using a scale of 100 while children's skill was

assessed using a checklist on hand washing with soap. Children were categorized as skilled if the value was ≥75 and unskilled if the value was <75. Statistical testing was performed to examine the effect of the use of SEHATI application on increasing maternal knowledge and the relationship between mother's knowledge and child's skill using the paired t test and Spearman rho, respectively. This study was conducted from February to March 2017.

This research has received approval from the Health Research Ethics Committee, Faculty of Medicine, Universitas Padjadjaran, Bandung with the letter of ethics approval number: 70/UN6.C10/PN/2017.

Results

Thirty-three subjects met the inclusion criteria and exclusion criteria. During the study, four mothers did not open the SEHATI application every day for 20 minutes as required by the study that they were considered as dropping out from the study; hence, the number of respondents became 29 respondents. Mothers and children who dropped out were included in the post-test. Details on these respondents are listed in Table 1.

Based on Table 1, the majorities of respondents were 30–39 years old and did not work. The most respondents graduated from senior high school and were multiparous. Most of the children were eight years old and there were more girls than boys.

Based on Table 2, the average knowledge score before the use of SEHATI application intervention was significantly different from the average knowledge score after the use of SEHATI application (p<0.001). An increase of 58.4% in knowledge was observed after the use of SEHATI application.

Table 3 shows a relationship between maternal knowledge and children's skill (p<0.001) of 0.63, showing a positive strong correlation.

Discussion

Providing health-related information through health education is one way to increase one's knowledge. This study shows that SEHATI application affects mother's knowledge by increasing the knowledge (p<0.001). This result supports the result of Xuan and Hoat[17] in Vietnam which concluded that knowledge increases after a health education intervention. The same findings

Table 1 Subject Characteristics

Characteristics	n=29
Mother	
Age (years)	
<30	6
30−39	17
≥40	6
Occupation	
Working	9
Not working	20
Education	
Basic (elementary, junior high school)	9
Senior high school	15
College (diploma, university)	5
Parity	
Primipara	7
Multipara	22
Child	
Age (years)	
6	3
7	11
8	15
Gender	
Male	13
Female	16

are also presented by Song et al.[6] and Maher et al.[11] who stated that the provision of information through health education on hand washing can improve maternal knowledge. The knowledge gained will make it easier to make decisions or actions related to the importance of washing hands.

Good knowledge on hand washing with soap is influenced by the media selected with media that convey information in a readily accepted, digested, and absorbed manner as a better medium. Educational media have the function to mobilize senses to facilitate perceptions and to better understand information or materials that are considered complicated to be easier to understand.[10] Media use plays a vital role in health interventions to change one's knowledge, awareness, attitudes, and behavior in maintaining hand hygiene.[12]

Audiovisual media offers a more exciting and non-monotonic method. The audiovisual media provides audio and visual stimulus that the optimum results can be obtained. These results are achieved because the sense that transmits the highest amount of knowledge is the visual sense (approximately 75–87%) followed by auditory

Table 2 Effect of Android-based SEHATI Application on Mother's Knowledge in Hand Washing with Soap

Mother's Knowledge Score	Measurement			Enhancement (%)
	Pretest	Posttest	p Value	
Mean (SD)	49.79 (7.83)	80 (11.56)	<0.001*	58.4 %
Median	48	76		
Range	36–64	60–100		

*t couples

Table 3 Relationship between Mother's Knowledge and Children's Skill in Hand Washing with Soap

Correlations	Measurement			
	Pretest		Posttest	
	sr*	p Value	sr*	p Value
Mother's knowledge and children's skills	0.22	0.91	0.63	<0.001

*Spearman rho

sense (13%) and other senses (12%).[10] This media has the advantage of showing the skills related to movements such as demonstrating hand washing steps.[12,18]

SEHATI application is a media that provides health information on hand washing with soap in an audiovisual form that includes images, sounds, and animations that should be accessed 20 minutes a day. Animated images in SEHATI application aim to attract mothers to learn the contents provided in the application and to make it more convenient for mothers to understand the contents presented, especially those regarding the steps in washing hands with soap. This application is proven to be effective in increasing mother's knowledge on hand washing with soap. This finding is supported by findings from several studies that compare the effectiveness of the use of audiovisual media to leaflet media suggesting that the use of audiovisual media is more effective than leaflets in conveying information to improve the hand washing knowledge, attitude, and behavior.[10,12,18]

Electronic media has become a big part of human life and has shaped everyone's life. As many as 85% of internet users in Indonesia access the internet using cellular phones or cellphones.[19] Smartphones are very suitable as the media for education in developing areas.[16] Smartphones can be used to assist medical activities, as well as

in seeking health information, reference guides, personal health improvement, disease prevention, early detection, and determination of diagnosis and therapy.[14,21,22] The use of smartphones provides satisfactory results in health education or health promotion.[22] Messages delivered quickly and in real-time through a smartphone can stimulate one's understanding to be more comprehensive. A study by Herlina[23] explained that smartphones are useful media to convey information to increase maternal knowledge. Other studies also explain that the use of smartphone applications has the potential to be used as a medium in health education or health promotion that can improve one's knowledge and skills.[24]

Knowledge is a very important domain for triggering one's actions. Knowledge can influence the mind and how information is understood. Mother's knowledge is one of the factors that can affect skills in children.[8] Skill is defined as physical activities that involve psychomotor movement. The present study indicates that there is a relationship between mother's knowledge and children's skills in hand washing with soap, which is evident by a strong correlation between mother's knowledge and children's skills. A previous study by Asekun-Olarinmoye et al.[9] suggested that mothers with good knowledge on hand washing with soap tend to give more

motivation to their children to wash their hands.

Mother has thoroughness in teaching children to wash their hands compared to their husbands. Mother is the first person children encounter in their lives. All behaviors, ways to educate children, and their habits can be used as examples for children so that children's dependence is usually more on mothers than on fathers.[6] Vivas et al.[25] in their study have explained that mother is the primary caregiver who was in charge for teaching and creating personal hygiene habits including hand washing with soap.

Hand washing skill and habit in children are shown to be predominantly influenced by the parents. Children mostly learn how to wash their hands correctly from their parents (91.9%) followed by health workers (50.0%) and teachers (34.9%). Therefore, parental knowledge is essential in forming hand washing behavior.[5,6] Parents who have a high level of knowledge will have a high level of awareness to teach their children to wash their hands. A study conducted by Song et al.[6] was able to show that parents who have strong health interests and health beliefs tend to have positive behaviors in promoting health, leading to children's behavioral change towards a clean and healthy lifestyle, including washing hands with soap. Consequently, children's skill in hand washing will be very much dependent on the involvement and thoroughness of their parents in teaching them this behavior.

Conclusion

When it is used a guide for parents to seek for health information, SEHATI has been shown to be able to improve mother's knowledge which will then improve children's skills in hand washing with soap.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgements

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RESEARCH ARTICLE

Friedman Tongue Position with the Obstructive Sleep Apnea Syndrome (OSAS) Correlation on Patient with Ischemic Stroke

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Abstract

Stroke is the number one cause of disability in the world. Sleep disturbances exacerbate post-stroke disabilities in addition to physical disorders. Sleep disorder breathing (SDB), especially obstructive sleep apnea syndrome (OSAS) is the most commonly found in stroke patients (more than 50%). Sleep disorders in patients with ischemic stroke may occur because of obstruction in the upper airway. To facilitate the assessment of the upper airway, Friedman set up a standard naso-velo-oropharyngeal examination area. There are four degrees of Friedman tongue position. This check can predict the presence or absence of OSAS. Obstructive sleep apnea syndrome can be assessed using STOP-BANG questionnaire, an instrument designed to rapidly detect obstructive sleep apnea (OSA) disorder, with an indication of score 5–8 is high-risk, 3–4 is moderate-risk, and 0–2 is low-risk. The method of this study was observational with cross-sectional design in acute phase ischemic stroke patient based on head CT-scan in RSAU dr. M. Salamun Bandung from August–December 2016. Statistical analysis using non-parametric Kruskal-Wallis test and Spearman's rank correlation test. The total subjects of this study were 38 people. The results showed that there was a significant relationship between Friedman tongue position and OSAS in stroke patients at RSAU dr. M. Salamun with p value=0.007. In conclusion, the tongue is an important anatomical structure in OSA patients, so evaluation of the position of the tongue is important to predict the severity of OSA.

Key words: Friedman tongue position, ischemic stroke, obstructive sleep apnea syndrome (OSAS)

Hubungan Derajat *Friedman Tongue Position* dengan Kejadian *Obstructive Sleep Apnea Syndrome* (OSAS) pada Penderita Strok Iskemik

Abstrak

Strok merupakan penyebab disabilitas nomor satu di dunia. Disabilitas pascastrok selain gangguan fisik diperburuk dengan gangguan tidur. *Sleep disorder breathing* (SDB) terutama *obstructive sleep apnea syndrome* (OSAS) paling sering ditemukan pada pasien strok (lebih dari 50%). Gangguan tidur pada penderita strok iskemik dapat terjadi karena obstruksi pada saluran napas atas. Untuk memudahkan penilaian saluran napas atas, Friedman membuat standar pemeriksaan daerah naso-velo-orofaring. Terdapat empat derajat *Friedman tongue position*. Pemeriksaan ini dapat memprediksi ada tidaknya OSAS. *Obstructive sleep apnea syndrome* dapat dinilai menggunakan STOP-BANG *questionnaire*, suatu instrumen yang dibuat untuk dapat secara cepat mendeteksi *obstructive sleep apnea* (OSA), dengan indikasi skor 5–8 risiko tinggi, 3–4 risiko sedang, dan 0–2 risiko rendah. Metode penelitian ini adalah observasional dengan rancangan *cross-sectional* pada pasien strok iskemik fase akut berdasar atas hasil CT-*scan* kepala di RSAU dr. M. Salamun pada Agustus–Desember 2016. Analisis statistik menggunakan uji nonparametrik Kruskal-Wallis dan uji korelasi rank Spearman's. Total subjek penelitian 38 orang. Hasil penelitian menunjukkan bahwa terdapat hubungan bermakna antara derajat Friedman tongue position dan kejadian OSAS pada pasien strok di RSAU dr. M. Salamun dengan nilai p=0,007. Simpulan, lidah merupakan struktur anatomi yang penting pada pasien OSA sehingga evaluasi posisi lidah penting untuk memprediksi tingkat keparahan OSA.

Kata kunci: *Friedman tongue position, obstructive sleep apnea syndrome* (OSAS), strok iskemik

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Introduction

The prevalence of stroke, in Indonesia, was 8.3 per 1,000 population, and the one diagnosed by health workers was 6 per 1,000 population. The data shows that around 72.3% of cases in the community diagnosed by health workers. There are 11 provinces in Indonesia, including West Java with the prevalence of stroke above national prevalence.[1] Stroke classification based on anatomic pathology, and the cause consists of ischemic stroke and bleeding stroke. Research in hospitals of Denmark showed that the ischemic stroke rate was higher at 89.9% while bleeding stroke was 10.1%.[2] In China and Japan also showed ischemic stroke around 70–80% and bleeding stroke 20–30%.[3] Stroke research by Misbach[4] in Southeast Asia, ischemic stroke was 74% while bleeding stroke was around 26%.

Stroke patients, especially ischemic stroke, can experience a variety of sleep disorders. Stroke is a disease that causes disability in the world's adult population in large numbers. Stroke patients often do not get adequate rehabilitation services so that when they return to work, they have limited function, weakness, sleep disturbances and psychological disorders.[5]

Types of sleep disorders in stroke patients depend on the neurological deficit they experience. Sleep disorder breathing (SDB), especially obstructive sleep apnea syndrome (OSAS) most commonly found in stroke patients (more than 50%). SDB can be caused by stroke, mainly due to a disturbance in the respiratory center in brainstem or bulbar/pseudobulbar paralysis.[6] Another sleep disorder that can occur in stroke patients is circadian rhythm disorder or sleep-wake disorder (SWD) which is about 20–40% of patients with stroke and insomnia.[7]

Sleep disorders in patients with ischemic stroke can occur because there is an obstruction in the upper airway. To facilitate the assessment of the upper airway, Friedman made a standard examination of the naso-velo-oropharynx region. There are four degrees of Friedman tongue position examination. First degree is patient able to open the mouth without removing the tongue; second degree, the entire uvula is visualized; third degree, the uvula is visualized, but the tonsils are not visible; and the fourth degree the mole palate is visualized, but the uvula is not visible; only the hard palate visualized. This examination can predict the presence or absence of OSAS.

We can assess OSAS using the STOP-BANG questionnaire. This instrument made to be able to quickly detect obstructive sleep apnea (OSA) sleep disorders, with an indication of a score of 5–8 for a high risk of OSA, 3–4 risks of OSA, and 0–2 low risk of OSA. This paper will describe the relationship between the degree of Friedman tongue position and the incidence of obstructive sleep apnea syndrome in ischemic stroke sufferers.

Methods

The form of this study was observational with a cross-sectional study design, carried out in the Neurology Section of Air Force Hospital (*Rumah Sakit TNI Angkatan Udara*/RSAU) dr. M. Salamun Bandung from August to December 2016. The research subjects were all patients treated in the Neurology Section of RSAU dr. M. Salamun. The selection of research subjects based on arrival (consecutive admission sampling). Cases undergo a complete disease history, general physical examination, neurology examination, and neuroimaging head CT-scan. They then examined the degree of Friedman tongue position and filled STOP-BANG questionnaire.

This research approved by the Health Research Ethics Committee of Faculty of Medicine, Universitas Islam Bandung by ethics approval letter number: 386/Komite Etik.FK/IX/2016.

Results

Table 1 shows that the average age of ischemic stroke patients in RSAU dr. M. Salamun was 61.79 years old, standard deviation 9.39 years, median 62.00 years, with the youngest age was 42 years, and the oldest age was 83 years, most were in the 61–70 year age group.

The difference in BMI, the circumference of the neck and waistline between men and women in patients of ischemic stroke in RSAU dr. M. Salamun can be seen in Table 2. The results of the independent t test on the degree of confidence 95% indicated that there was no statistically difference in BMI, between neck circumference, and the waistline between men and women in patients of ischemic stroke in RSAU dr. M. Salamun with value p=0.728, p=0,105 and p=0.943 (p value>0.05) respectively.

Relationship between the degree Friedman tongue position and obstructive sleep apnea is in Table 3. Table 3 shows that analysis of chi-square test on a 95% degree of confidence showed there

Table 1 Characteristics of Subjects based on Age and Sex

Age and Gender	n=38
Age (years)	
41–50	5
51–60	12
61–70	14
71–80	6
81–90	1
Mean (SD): 61.79 (9.39)	Minimum: 42
Median: 62.00	Maximum: 83
Gender	
Man	15
Woman	23

is a meaningful relationship between degrees of Friedman tongue position with OSAS (p value=0.007, p≤0.05).

Discussion

Stroke is a disorder of brain functional focal and global acute, more than 24 hours, comes from blood flow disorder of the brain and is not caused by circulatory disorders of the brain at a glance, brain tumor, stroke or trauma due to a secondary infection. Ischemic or brain hemorrhage can cause a stroke with neurologic deficits that occur suddenly. Ischemic stroke caused by focal cerebral vascular occlusion, which causes a decline in the supply of oxygen and glucose to the brain undergoes occlusion.[8]

The risk of stroke was made up of their risk factors that cannot be changed such as age, gender, race, family history, history of transient ischemic attack (TIA), coronary heart disease, atrial fibrillation and heterozygous or homozygous for the homocystinuria, while the risk factors

be changed i.e., hypertension, diabetes mellitus, smoking, alcohol and drug, hyperuricemia and other.[9–11]

The disease is the leading cause of death, and stroke disability chronicles the highest in the age groups above 45 years of age in Indonesia.[9]

Data from Table 1 showed the ischemic stroke mostly suffered by women and patients aged 61–70 years—the results following the review of the literature and similar to several other studies.

The research in Solok Selatan General Regional Hospital showed many ischemic stroke sufferers were women (32.29%) and may occur above 50 years old (45.83%).[10] A study conducted in Prof. Dr. R. D. Kandou General Hospital Manado July 2012–June 2013 period also showed many ischemic stroke sufferers were at the age range 51–65 years.[11]

Research in Dr. Saiful Anwar Regional General Hospital during 1 July–31 December 2012 showed similar data that many ischemic strokes occur in women (58%) and patients aged 65–74 years (31.6%).[12]

The ischemic stroke can occur regardless of the age, but the pattern of ischemic stroke disease tends to occur in older age groups due to impaired blood flow which is very dependent on the condition of the blood vessels. Blood vessels in older people likely to experience changes in a degenerative way, and as the result of the process of atherosclerosis. The speed of the process of the blood vessel impairment to stroke depends on the lifestyle, eating patterns, and behavior of a person.[11]

Gender becomes a risk factor for the occurrence of stroke, especially in women because women have the hormone estrogen that helps HDL LDL catabolism and hepatic. Decrease LDL catabolism due to the decrease in estrogen levels that it can increase the risk of the occurrence of

Table 2 The Difference in BMI, the Circumference of the Neck and Waistline between Men and Women in Patients of Ischemic Stroke in RSAU dr. M. Salamun

Variables	Man		Woman		p Value
	Mean (SD)	Median (Min–Max)	Mean (SD)	Median (Min–Max)	
BMI	23.26 (2.94)	22.66 (19.20–27.68)	23.65 (3.61)	23.40 (17.70–33.20)	0.728
Neck circumference	36.93 (3.15)	38.00 (31–43)	34.70 (4.53)	35 (27–44)	0.105
Abdominal circumference	88.07 (13.15)	90.00 (62–108)	87.78 (11.02)	86 (71–111)	0.943

Table 3 Relationship on the Friedman Tongue Position Degree and Obstructive Sleep Apnea Syndrome

Obstructive Sleep Apnea Syndrome	Degrees Friedman Tounge Position				p Value
	Degree I (n)	Degree II (n)	Degree III (n)	Total (n)	
Low risk	3	7	0	10	
Medium risk	3	12	0	15	0.07
High risk	0	9	4	13	

*Chi-square test

aterosklerosis.[12]

Obstructive sleep apnea is a disorder that is part of the sleep-disorder breathing syndrome complex. OSA is the state of occurrence of upper airway obstruction periodically during sleep that causes intermittent breath stop, either complete (apnea) or partial (hypopnea).[13]

Obesity is a risk factor for going to his various diseases in developing countries and the developing countries, for example, the disease due to obesity, such as type II DM, hypertension, cardiovascular disease, obstruction sleep apnea/ hypopnea syndrome (OSAHS).[14]

A variety of methods can be used to find out the Anthropometry happened his obesity; these methods include measurement of BMI, waist circumference, hip circumference, arm circumference, and circumference of the neck.[14]

Table 2 shows the value of BMI, the circumference of the neck, and the waist circumference increased in ischemic stroke patients who have OSA.[15–17]

Obesity can alter the volume and shape of the anatomy of the tongue so that the tongue raises that will ultimately reduce the volume of the upper respiratory tract.[13]

Based on the results of the study revealed that the likelihood of obesity could worsen OSA because of fat deposits on the specific location. The buildup of fat in the tissue around the airway the top producing lumen airway smaller and improvement of collapsibility of the upper respiratory tract, so that contribute to the onset of apnea. [18]

The form of the oropharynx and hypopharynx changed significantly to the increase of the BMI. The higher the BMI, the transverse diameter of the oropharynx and hypopharynx lumen will decrease and subsequently related to obstructive sleep apnea.[19]

Neck circumference reflects regional obesity around the pharynx as the upper respiratory tract and has a stronger correlation value against the risk of OSA compared with BMI. The amount of adipose tissue deposits below the pharynx has a relationship with the OSA risk and the degree of severity, proven by studies on obese individuals. Obese individuals have a more visceral adipose tissue compared to non-OSA individual.[20]

The result from this research was similar to the Schafer. Its report that the risk of OSA has a stronger correlation with the accumulation of adipose tissue in the intra-abdomen regio than neck regio or BMI. It is proof that waist circumference is a good predictor of OSA than the neck circumference or BMI. So it can be inferred, the accumulation of adipose tissue in the pharynx or neck and intra-abdominal regio, may very well be a strong predictor and contribute to the pathogenesis of the occurrence of OSA. It may become a possible influence on the pathogenesis of OSA via different mechanisms.[20]

Evaluation of anatomy of the upper respiratory path is part of the physical examination in people with obstructive sleep apnea. Inspection there is an abnormality of structure or the narrowness of the channel the breath over often found in obstructive sleep apnea patients. Friedman tongue position is one way the physical examination are quick to predict the existence and severity of obstructive sleep apnea.[21]

From Table 3 obtained, the results are there is a relationship between degrees of Friedman's tongue position and obstructive sleep apnea in patients of ischemic stroke in RSAU dr. M. Salamun. The result is following the various reviews of the literature and previous researches.[21–23]

Three factors play a role in the pathogenesis of obstructive sleep apnea, i.e., the pharyngeal

area for breath channel obstruction. The enlargement of the tongue can cause occlusion of the nasopharynx and oropharynx, causing airflow cessation although respiratory process continue while sleeping.[24]

The tongue is an essential anatomical structure in obstructive sleep apnea patients so that evaluation of the tongue is vital for predicting the severity of obstructive sleep apnea.[25]

Soft palate, tonsil, and base of the tongue is the main component in the oropharynx and hypopharynx. The size and shape of these three structures can affect the size of the oropharynx and subsequent events related to obstructive sleep apnea.[26]

To evaluate the closure of channels breath, it is essential to know is the size of the pharynx, especially the oropharynx. The oropharynx channel size is determined by the walls which form the channel, i.e., anterior, posterior, and lateral wall. The palate mole and tongue form the anterior wall of the oropharynx. The posterior wall of the oropharynx is formed by superior constrictor muscles, medially, and inferiorly. The lateral wall of the oropharynx formed by the muscles of the oropharynx, namely styloglossus, palatopharyngeus, palatoglossus, stylopharyngeus, hyoglossus, stylohyoid, and superior pharyngeal constrictor, medial and inferior.[27]

Conclusion

There is a relationship between the degree of Friedman tongue position and obstructive sleep apnea syndrome in patients of ischemic stroke in RSAU dr. M. Salamun Bandung.

Conflict of Interest

All authors declare that there was no conflict of interest in this article.

Acknowledgements

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RESEARCH ARTICLE

Mothers Knowledge and Perception of Toddler Growth Monitoring Using iPosyandu Application

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Abstract

Growth monitoring of toddler in Indonesia is an essential thing that should be done by a mother using the Child Health Card (*Kartu Menuju Sehat/KMS)*. This card purpose is also to detect the growth interference of a toddler. However, the KMS cannot be directly filled by working mother because sometimes it is not her who takes the toddler to integrated service posts (*pos pelayanan terpadu/posyandu*). The iPosyandu application is an application that makes it easy for mothers at any time and anywhere to monitor their children growth. The iPosyandu application can be downloaded at Play Store for free. This research aims to see the knowledge and perception of the mothers in growth monitoring of the toddlers using iPosyandu. The descriptive study with cross-sectional approach conducted in October 2017 in Pasawahan Kidul village, Purwakarta regency. The subjects were 81 mothers with toddler recruited using purposive sampling technique. Results showed that 56% of mothers in 20−35 years old group and 42% of mothers with 2−3 children had only moderate knowledge. Thirty-eight percent of mothers 20−35 years old, 25% with 2−3 children and mostly had junior high school education level agreed that iPosyandu is beneficial. In conclusion, mothers who have sufficient knowledge would agree to use iPosyandu to monitor the growth of toddlers.

Key words: Growth of toddlers, iPosyandu application, knowledge, mothers, perception

Pengetahuan dan Persepsi Ibu dalam Memantau Pertumbuhan Balita Menggunakan Aplikasi iPosyandu

Abstrak

Pemantauan pertumbuhan balita di Indonesia merupakan hal yang penting dilakukan oleh ibu dengan menggunakan Kartu Menuju Sehat (KMS) yang bertujuan mengetahui gangguan pertumbuhan balita secara dini. Akan tetapi, KMS tersebut tidak dapat secara langsung dilihat oleh ibu yang sedang bekerja karena terkadang bukan ibu yang mengantar balita ke posyandu. Oleh karena itu, aplikasi iPosyandu merupakan suatu aplikasi yang memudahkan ibu setiap saat dan di mana pun berada untuk memantau pertumbuhan berat badan balita berdasar atas usia. Aplikasi iPosyandu dapat diunduh pada *Play Store* secara gratis. Penelitian ini bertujuan mengetahui pengetahuan dan persepsi ibu dalam memantau pertumbuhan balita menggunakan aplikasi iPosyandu. Penelitian ini menggunakan metode deskriptif dengan pendekatan *cross-sectional*. Penelitian ini dilaksanakan pada bulan Oktober 2017 pada ibu yang memiliki balita di Desa Pasawahan Kidul, Kabupaten Purwakarta. Subjek penelitian adalah 81 ibu dengan balita yang diambil menggunakan teknik *purposive sampling*. Hasil penelitian menunjukkan bahwa 56% ibu dalam kelompok 20−35 tahun dan 42% ibu dengan 2−3 anak hanya memiliki pengetahuan sedang. Tiga puluh delapan persen ibu berusia 20−35 tahun, 25% dengan 2−3 anak, dan sebagian besar berpendidikan sekolah menengah pertama setuju bahwa iPosyandu bermanfaat. Simpulan, ibu yang memiliki pengetahuan cukup setuju menggunakan iPosyandu untuk memantau pertumbuhan balita.

Kata kunci: Aplikasi iPosyandu, ibu, pengetahuan, persepsi, pertumbuhan balita

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Introduction

Growth monitoring of toddler is an essential thing to do as early detection of growth disorder.[1] Children aged 12–59 months need to get growth monitoring service at least eight times a year, to analyze children's growth disorders. Growth disorders can affect children's growth, and development.[2] Ariyani and Solihat[3] showed that under-five years old children who are underweight experience developmental delays, especially motoric skills and language.

In Indonesia, toddler growth monitoring usually is done routinely every month at integrated service posts (*pos pelayanan terpadu/posyandu*) that integrated with *pusat kesehatan masyarakat* (*puskesmas*) as a primary health service center. The Ministry of Health (Indonesian: *Kementerian Kesehatan*) regulates at least 80% of children should be weighed regularly at *posyandu* to know their weight growth pattern by health workers.[4]

The Basic Health Research (*Riset Kesehatan Dasar/Riskesdas*) 2013 mentioned that the achievements of toddler weighing in *posyandu* is 80.30%, which means that it increases compared to 2012, which was 75.1%. In West Java, the proportion of toddler weighing in *posyandu* is 80.30%. Although the toddler weighing in *posyandu* in Indonesia and West Java met the Strategic Plan (*Rencana Strategis/Renstra*) 2013 target of 80%, it still needs to increase further.[5]

A mother has the first and foremost role in the toddler's growth and development. Mother and family contribute to toddlers growth process by providing balanced nutrition according to their age. The growth monitoring and developmental screening needed periodically in *posyandu*. The result of toddlers growth monitoring and developmental screening in *posyandu* recorded in the form of toddler growth chart named the Child Health Card (*Kartu Menuju Sehat/KMS)* in the maternal and child health (MCH) handbook.[6] The data recorded manually by a community health worker or midwife who served in *posyandu*. Manual recording and data processing has several drawbacks; they take time, prone to inaccuracy in input, processing, and reporting. It was also prone to loosing and damaged of MCH handbook by the mothers. Then, the mother did not want to keep the KMS and decided to give them to keep to cadre because they afraid to lose the KMS.[7]

To resolve these problems, the researchers developed iPosyandu application as *posyandu* data processing system and information provider (Figure 1 and Figure 2). The iPosyandu application is mobile apps on the Android operating system that can store data recording of toddlers weighing and height measurement that can be accessed by the mother anytime and anywhere on their own smartphone.[8]

Mobile apps nowadays considered useful and facilitate lots of information access. In a study conducted by Susilawati et al.,[9] mobile application "*Sahabat Ibu Balita*" can improve mothers knowledge and skill in monitoring toddler growth. In another study by Wahyuni,[10] mobile application "*MOCA*" influence in increasing
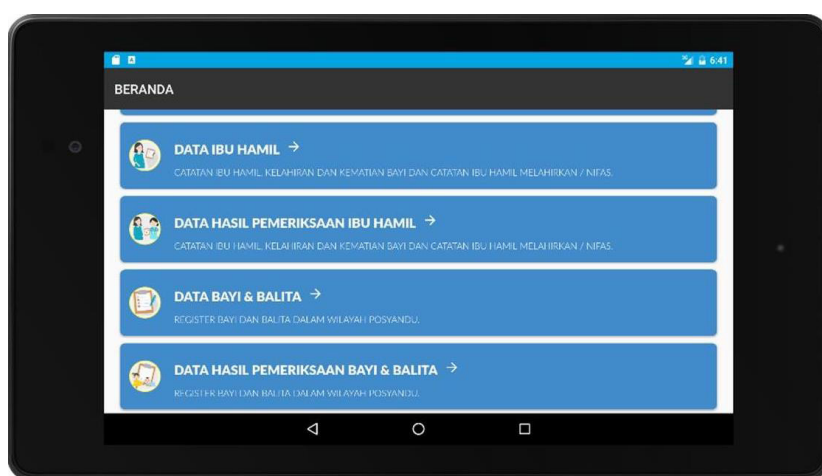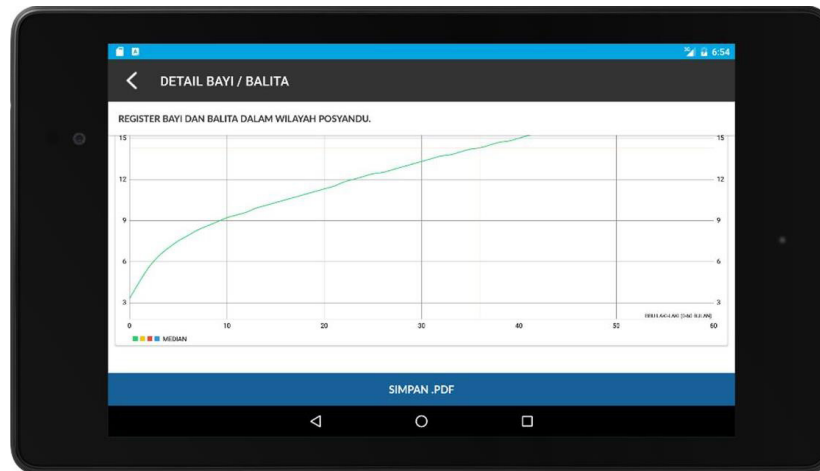

Figure 1 The Application Menu of iPosyandu

Figure 2 Chart of Toddler Weight Growth

knowledge and skill of parent in stimulating the growth of infants aged 12–18 months.

Based on the background above, the writer interested to find out the mothers knowledge and perception of toddler growth monitoring using iPosyandu application.

Methods

This research used the descriptive method with a cross-sectional approach. This study conducted in October 2017 to a mother who has a toddler in Pasawahan Kidul village, Purwakarta regency. This research was applied purposive sampling technique, with the total number of the sample was 81 mothers. The data were collected using questionnaires about knowledge of *posyandu*, MCH handbook, and toddlers' mother perception about toddlers growth monitoring in *posyandu* using iPosyandu application. The inclusion criteria in this study were mothers came to *posyandu* and agreed to participate. This study approved by the Health Research Ethics Committe, Faculty of Medicine, Universitas Padjadjaran Bandung with letter number: 98/UN6.C10/PN/2017.

Results

This study is about the mother's knowledge and perception in using iPosyandu application based on age, parity, and education.

Table 1 represents that majority mother who has sufficient knowledge of monitoring toddlers growth using iPosyandu application, is aged 20–35, with 2–3 children and graduated from junior high school. While in Table 2, mothers who agree the most to monitor toddlers growth using iPosyandu application is a mother age 20–35 years old.

Discussion

Based on the results in Table 1, the majority of the mothers with sufficient knowledge is 55.6% age 20–35 years. The group represents those who frequently access the internet and have more practiced operating internet application. They were the group which familiar with having information and understand the information content from the internet. The age period is also the culmination of physical, cognitive, and socio-emotional in human developments. Age affects mindset and comprehension which can be when someone has a mature age, then they increase their knowledge too.[11]

Internet users in Indonesia reach 88.1 million people, and 51% are women, with 54% in West Java.[12] The data shows that women are accessing the internet most often and get much information sourced from the internet.

The internet rated as one of the media most famous as a search tool for the data and health information, one of them as information on mother and child health development.[13] Currently, information about mother and child development in *posyandu* is still inferior, difficult to control, and monitored. This problem arises because there is no integrated model data processor and

Table 1 Mothers' Knowledge Using iPosyandu Application

Characteristics	Level of Knowledge					
	Good		Moderate		Not Good	
	n=6	%	n=55	%	n=20	%
Age (years)						
<20	0	0	0	0	0	0
20−35	4	5	45	56	15	18
>35	2	3	10	12	5	6
Parity						
1	2	3	20	25	5	6
2−3	4	5	34	42	12	15
>3	0	0	1	1	3	4
Education						
Uneducated	0	0	0	0	1	1
Not graduated from elementary	0	0	1	1	0	0
Elementary	0	0	8	10	1	1
Junior high	0	0	22	27	10	12
Senior high	6	7	21	26	7	9
College	0	0	3	4	1	1

information provider that easy to access and read, also fast and accurate. The monitoring system of mother and child health development is very hard in a particular area. Providing decision-making data used on in mothers and child service, were often late, incomplete, and sometimes inaccurate.[14]

The KMS chart of the toddlers' weight and height, which is vital to monitor children growth, not appropriately utilized because the KMS collected in community health worker. The reason, as mentioned before, was because they were afraid to lose it. The comprehension of a mother to the KMS chart is essential that

Table 2 Mothers' Perception Using iPosyandu Application

Characteristics	Level of Knowledge							
	Strongly Agree		Agree		Disagree		Strongly Disagree	
	n=12	%	n=38	%	n=26	%	n=5	%
Age (years)								
<20	0	0	0	0	0	0	0	0
20−35	9	11	31	38	23	28	1	1
>35	3	4	7	9	3	4	4	5
Parity								
1	4	5	13	16	9	11	1	2
2−3	7	9	23	28	16	13	4	5
>3	1	1	2	3	1	1	0	0
Education								
Uneducated	0	0	0	0	1	1	0	0
Not graduated from elementary	0	0	1	1	0	0	0	0
Elementary	3	4	2	3	2	3	2	3
Junior high	2	3	20	25	10	12	0	0
Senior high	6	7	14	17	11	14	3	4
College	1	1	1	1	2	3	0	0

mother can take action as early as possible if the growth of children is not appropriate with their age. The mobile application easily accesses to store toddler's health records, which is why it is important to have it on android-based mobile devices.[7] To facilitate the mother to get more accessible information about toddlers weight growth and height measurement, iPosyandu application is the answer.

The iPosyandu application is an application that used in *posyandu* accessed by mothers, community health worker, or health worker. All of the examination of pregnant woman, weighting, height measurement, input in the iPosyandu application by a community health worker or midwife.[15]

Based on the parity, 43% of mothers with 2–3 children have sufficient knowledge. Maternal parity can affect the level of knowledge because parity related to mothers experience. The more experience they have, the more knowledge that mother will have.[11] Mothers tend to seek information over the internet because it is considered easier. Information that sourced from the internet becomes one of the factors that affect the level of someone's knowledge, and the internet becomes a currently essential needs.[16]

Mobile phones nowadays not only used as a communication device but for other needs, such as to do business, access information, play games, and many others. It is so easy to use applications provided on the phone that many internet users are using the phone as a daily necessity.[17] The increase in technological developments in the era of informatics like this should also be used to stimulate growth and development. This type of information is not difficult to obtain. There is an influence on the use of growth and growth stimulation applications on the level of maternal knowledge and growth of children aged 9–24 months.[18]

According to the WHO in Early Childhood Development and Disability, the community or family environment situation, interaction of children and parents, and access to facilities and infrastructure are some factors that can affect children growth. To achieve the maximum growth and development of children, the role of the family is critical.[19] The role of parents in the parenting process is vital, especially in meeting the basic needs of children (teaser, foster care, compassion), one of which is the care of nutrition and stimulation. There is a correlation between nutritional and growth and also stimulation with early childhood development.[20] According to the result of Suryanto et al.'s[21] research, the role of the family can give positive effect to toddlers growth and development. The mother role in the great of child growth is considered more significant than the father or other family members.

Based on the classification of education, the majority of a mother who graduated from junior high school and high school/vocational school has sufficient knowledge that was 27.9%. Education can affect mother knowledge. Internet users in Indonesia dominated by users who graduated from high school (64.7%), bachelor degree (16.9%), and junior high school (9.7%).[12] Education can expand the insight and socialization of people because education can make someone think openly and more efficiently to accept new idea and technologies. The degree of education defined the person to receiving and understanding the knowledge, in general, the higher degree of education then the knowledge will be better.[22]

Based on Table 2, most of the respondents agree to monitor toddlers growth using iPosyandu application. Perception is the process by which people translate sensory impression into a coherent and unified view of the world around them. Though necessarily based on incomplete and unverified (or unreliable) information.[19] Most of the mother's age 20–35 years agreed to use iPosyandu application to monitor toddlers growth; it was 38%. Age can affect maturity level in thinking and receiving information. Information and knowledge will build someone's mindset and perception.[23]

Moreover, information that mothers get through mobile application can be used easily, affordable, and can be accessed everywhere. It can solve the problem of remote *posyandu* and the difficulty of transportation to reach *posyandu*.[24]

Based on parity characteristics, the majority of mothers, 28% with 2–3 children agree on iPosyandu to monitoring toddlers growth. Mothers experience of the previous parenting system can develop a mother's ability to build perceptions and decision making that are the result of integrated scientific reason with real problems.[25]

Base on education, 24% mother who graduated from junior high school, agrees that iPosyandu application using to monitored toddlers growth. The higher education of a person, the more

comfortable they get information so that the more knowledge they have. However, the knowledge object had both negative and positive aspects. These two aspects can affect perception. Mother knows the more positive aspect, then the possibilities of mother to have positive perception is higher.[23]

Conclusion

The conclusion of this study is the majority of the mothers that have sufficient knowledge agree to use iPosyandu application to monitor the growth of toddlers.

Conflict of Interest

All authors have not conflict of interest in publishing this article.

Acknowledgement

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RESEARCH ARTICLE

Effect of Integrated Reproductive Health Learning Module Application on Student's Motivation and Learning Satisfaction in Junior High School

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Abstract

One of the potential public health issues in Indonesia is adolescent reproductive health (ARH) issue, particularly premarital sex and promiscuity behaviors which create the risk for unwanted pregnancies and sexual transmitted diseases such as HIV and AIDS. This study aimed to increase in student's motivation and learning satisfaction through the application of integrated reproductive health learning module in junior high school. This was a pre- and post-test quasiexperimental study with control group design on 358 seventh grade junior high school students in Bandung city. Sampling was performed using multistage random sampling method and subjects were divided equally into treatment group (n=179) and control group (n=179). Data collected were analyzed using chi-square test, Wilcoxon test, and Mann-Whitney test. Results showed that the application of integrated reproductive health learning module influenced motivation and satisfaction, which was evident from the increase in motivation and learning satisfaction scores in the treatment group (21.9% and 6.23%) when compared to the control group (2.2% and 6.1%). In conclusions, the use of integrated reproductive health learning module significantly influences student's motivation and learning satisfaction among seventh grade junior high school students.

Key words: Learning satisfaction, module, reproductive health, student motivation

Pengaruh Penerapan Modul Pembelajaran Kesehatan Reproduksi Terintegrasi terhadap Motivasi dan Kepuasan Belajar Siswa di Sekolah Menengah Pertama

Abstrak

Salah satu permasalahan kesehatan masyarakat yang potensial di Indonesia adalah masalah kesehatan reproduksi remaja (KRR) khususnya perilaku seks pranikah dan pergaulan bebas yang berisiko kehamilan yang tidak diinginkan dan penyakit infeksi menular seksual (IMS) seperti HIV dan AIDS. Penelitian ini bertujuan meningkatkan motivasi dan kepuasan belajar siswa dengan menerapkan modul pembelajaran kesehatan reproduksi terintegrasi di sekolah menengah pertama (SMP). Penelitian ini menggunakan *pre- and post-test quasi-experimental study* dengan desain kelompok kontrol pada 358 siswa kelas tujuh SMP di Kota Bandung pada Maret–April 2017. Pengambilan sampel dilakukan menggunakan metode *multistage random sampling* dan subjek dibagi secara merata menjadi kelompok perlakuan (n=179) dan kelompok kontrol (n=179). Data yang dikumpulkan dianalisis menggunakan uji *chi-square*, uji Wilcoxon, dan uji Mann-Whitney. Hasil penelitian menunjukkan bahwa penerapan modul pembelajaran kesehatan reproduksi terintegrasi memengaruhi motivasi dan kepuasan belajar yang terbukti dari peningkatan motivasi dan skor kepuasan belajar pada kelompok perlakuan (21,9% dan 6,23%) bila dibanding dengan kelompok kontrol (2,2% dan 6,1%). Simpulan, penerapan modul pembelajaran kesehatan reproduksi terintegrasi secara signifikan memengaruhi motivasi dan kepuasan belajar siswa kelas tujuh SMP.

Kata kunci: Kepuasan belajar, kesehatan reproduksi, modul, motivasi siswa

Introduction

Reproductive health is included as one of the government major programs as a result of the international convention in reproductive health which was held on 5–13 September 1994 in Cairo. Adolescent reproductive health (ARH) is one of aspects of the Sustainable Development Goals (SDGs) to reduce maternal mortality, which is more likely to happen among adolescents who have unwanted pregnancies and unsafe abortion, and HIV and AIDS control because adolescents are vulnerable to this disease when they are promiscuous.[1–3]

The lack of information about sexuality and ways to protect health and reproductive health has created a risk for adolescents in addition to their lifestyle, cultural values, and loose social control. Adolescents have limited access to information regarding reproductive health, making them seeking for the information from inappropriate sources and media. Sexual and reproductive health often receive little attention because it is considered culturally sensitive and is vulnerable to debates among various perspectives. As a result, various problems caused by poor ARH knowledger occurs, including premarital sex, teenage pregnancy, unsafe abortion, early marriage, sexual abuse, and rape and/or sexual violence which are widely reported by the media.[1,4–6]

Adolescent is defined as individuals aged 10–19 years in a dynamic growth and development phase.[7–10] According to the Regulation of the Minister of Health Republic of Indonesia,[11] adolescents are those in the age range of 10–18 years.[12] Meanwhile, the National Population and Family Planning Board (*Badan Kependudukan dan Keluarga Berencana Nasional*/BKKBN) defines adolescents as individuals aged 10–24 years who are not yet married.[9,13] The World Health Organization (WHO) estimates that the ratio of adolescents in the world is around 1–6 people or 1.2 billions. The number of adolescents West Java province in 2015 is 12,535,838 people or 27% of the total population 17 while in 2014 the number in Bandung city is 703,522 or 27.3% of the total population of 2,575,478 people.[17]

Adolescence is an important period in life. This period also includes the period of sexual learning and development which lasts from about thirteen years old to sixteen or seventeen years old.

Adolescence as a transition period from childhood to adulthood is characterized by rapid growth and development including physical, cognitive, behavioral, and psychosocial developments which are characterized by an increased desire to seek self-identity and independence. On average, puberty in adolescent girls starts 12–18 months faster than in adolescent boys. Because of the increased interest in sex, teenagers will try to find sex-related information from various sources such as discussing with friends, reading books about sex, and even trying certain behaviors to satisfy their curiosity.[3,18]

According to WHO, Indonesia is the country in ASEAN with the highest number of unwanted pregnancies that involves more than 32,000 women between 2010–2014.[7] In developing countries, around 15 million adolescents under the age of 18 are married and 2.5 million adolescents under the age of 16 have already given birth. The United Nations Population Fund (UNFPA) stated that 40% of HIV positive cases are detected at the age of 20–29 years. This shows that they were infected with HIV around 5–10 years before, that is when they were around 15 years old.[7,10]

Based on data from the Indonesian Child Protection Commission (*Komisi Perlindungan Anak Indonesia*/KPAI) showed that 32% of adolescents aged 14–18 years living in big cities in Indonesia (Jakarta, Surabaya, and Bandung) have been involved in premarital sexual intercourse and 62.7% of teenagers lost their virginity when they are still in high school and 21.2% of them even had an abortion.[19] Based on the 2015 data from the West Java Women Empowerment Child Protection and Family Planning Agency (*Badan Pemberdayaan Perempuan, Perlindungan Anak dan Keluarga Berencana*/BP3AKB), of all child-related violence cases, 40% involves sodomy, 11.3% involves rape, 3.48% involves incest, and 0.87% involves sexual abuse.[22] In 2015, West Java province has recording 801 and 354 cases of HIV and AIDS for adolescents aged 15–24 years old, respectively.[13] Unfortunately, in Indonesia the topic of sexuality is still considered taboos to be discussed with adults, including parents and teachers. However, with the increase use of internet by children and adolescents, these age groups know have open access to pornographic images and movies that may give a false impression about sexuality in real life. This is also added by the increased vulnerability in family

resilience caused by permissiveness as well wrong interpretation on religion in society.[19,21–23]

Sex education is one method to reduce and prevent sexual abuse and other negative impacts related to sexual behaviors. Sexual life contents must have been taught before a child leaves senior high school and preparations for it should have been done since junior high school.[24] In 2009, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Population Fund (UNFPA), the United Nations Program on HIV & AIDS (UNAIDS), and WHO issued a guide to sexuality education for schools, teachers, and health educators entitled International Technical Guidance on Sexuality Education: An Evidence-Informed Approach to Schools, Teachers and Health Educators (ITGSE). This guide divides learning objectives and main ideas for learning sexual and reproductive health based on age levels. In Indonesia, the ITGSE guideline has not yet been adopted by the Ministry of Education and Culture into the national curriculum. Thus, when someone has completed compulsory education in Indonesia (generally at the age of 19 years), he or she does not necessarily have good understanding on reproductive and sexual health.[27,28]

Efforts to overcome adolescent reproductive health problems, especially in developing countries, are based on program settings, namely school-based, mass-based, community-based, workplace-based, and health-based programs. School is one of the main institutions to ensure adolescents gain effective and inclusive access to sexual health education and to equip youth with knowledge, understanding, skills and attitudes to consider and make decisions regarding their sexual health.[25,26] Reproductive health education in adolescents can build values, attitudes and habits of adolescents to be able to respect and protect their own reproductive health and rights.[27] The use of a module will make learning activities to be better planned with clear outputs, independent, and comprehensive. Thus, the need to develop a module as teaching materials on reproductive health in schools is considered an urgent need to achieve quality learning.[28]

Basically, very little learning results can be obtained if students are not motivated. Student motivation is an important element needed for quality education.[30] Learning motivation and learning satisfaction are among determinants

for effective learning that will reinforce learning. To achieve this, it is necessary to clarify learning objectives to be achieved and to determine various controls on learning stimuli. Motivation is the most important aspect and there have been many studies performed due to its strong relationship with learning achievement.[31]

A module will be considered effective when its application creates a pleasant feeling and satisfaction to the students that they become motivated to learn and practice. Students as customers in education play an important role that is beyond the role of recipient of knowledge only and student satisfaction is a quality that is important for successful learning. This quality can be measured through the gap between perceived service and expected service by looking at satisfaction that is reflected from the suitability between expectations and what are obtained from a service.[33,34]

The preparation of this integrated reproductive health learning module was linked to the National 2013 Curriculum, UNESCO Comprehensive Sexual Education, and HOT Program that addresses reproductive health, sexuality, and individual development. This module was developed on the principles of evidence-based, contextual learning, and student centered, which is harmonized with adolescent development including physical, psychological, cognitive, and social by applying aspects of moral ethics, religion, culture, psychology, and information technology development.

Methods

This was a pre- and post-test quasiexperimental study with control group design conducted in 5 regions of Bandung city, namely west Bandung, east Bandung, southeast Bandung, north Bandung, and south Bandung in March–April 2017. The sampling in this study used multistage random sampling approach which includes all subjects in an affordable population with a total population of 179 respondents in each group.

An ethical clearance for this study was gained from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Padjadjaran with the issuance of ethical approval number: 363/UN6.C10/PN/2017. This study applied three basic principles of research ethics, namely respect to person, beneficence and non maleficence, and

justice.

Results

The integrated reproductive health learning modules was applied simultaneously for 4 weeks in state junior high schools that had never used similar reproductive health modules. All junior high school teachers involved in this study were teachers of Natural Sciences (NS) and Sports and Health Physical Education (HPE) totaling 18 people.

Data were collected after eight sessions were performed using the integrated reproductive health learning modules and analysis was performed to determine the effect of the application of integrated reproductive health learning modules on learning motivation and learning satisfaction of seventh grade junior high school students. As shown in Table 1 respondents were homogenous which enable comparison between the two groups.

Significant differences in motivation scores and learning satisfaction before and after the application of integrated reproductive health learning modules were seen (p<0.05). The increase in motivation score and learning satisfaction before and after treatment in the treatment group (21.9% and 6.23%, respectively) was better than those in the control group (2.2% and 6.1%, respectively), as listed in Table 2.

Table 3 presents that in the treatment group, 125 of 179 students (69.8%) experienced improvement in learning motivation, and 111 of 179 students (62%) experienced improvement in learning satisfaction. The increase in motivation

Table 1 Characteristics of Respondents

Characteristics	Groups		p Value
	Treatment (n=179)	Control (n=179)	
Age			0.144
X (SD)	12.64 (59.7)	12.73 (55.9)	
Range	12−16	12−15	
Median	13	13	
Gender			0.833
Boys	86	88	
Girls	93	91	

Table 2 Differences in Motivation Score and Learning Satisfaction

Variables	Groups				p Value
	Treatment (n=179)		Control (n=179)		
	Pretest	Posttest	Pretest	Posttest	
Motivation					<0.001
X (SD)	66.8 (12.6)	81.4 (8.1)	67.4 (10.8)	68.9 (10.5)	
Range	14.5−85.5	42.5−100	24.2−83.3	48.6−98.6	
Median	69.4	82.8	70.4	76.4	
p value	<0.001		0.081		
Increase (%)	21.9		2.2		
Satisfaction					<0.001
X (SD)	78.36 (13.8)	83.57 (9.3)	83.95 (9.99)	79.12 (10.66)	
Range	50−100	55.56−100	50−100	51.39−100	
Median	80.6	83.3	84.72	76.39	
p value	<0.001		0.070		
Increase (%)	6.23		6.1		

Table 3　Differences in Increased Motivation and Learning Satisfaction

Variables	Groups		p Value
	Treatment (n=179)	Control (n=179)	
Motivation			<0.001
Good	125 (69.8%)	54 (30.2%)	
Poor	54 (30.2%)	125 (69.8%)	
Increase (%)	69.8	30.2	
Satisfaction			<0.001
Good	111 (62%)	68 (38%)	
Poor	68 (38%)	111 (62%)	
Increase (%)	62	38	

and learning satisfaction was statistically very significant ($p \leq 0.05$).

Discussion

Student learning motivation in this study was measured using a questionnaire developed by Pintrich et al.,[36] Motivated Strategies for Learning Questionnaire (MSLQ), with 31 items. The questionnaire evaluates learning by emphasizing the concepts of cognitive psychology in assessing students' motivational orientation. In the study process, before the integrated reproductive health learning module was used, the teachers were equipped with training regarding the use of the module for 3 days. The objective was to make teachers understand the contents and process for delivering the module that it can be applied correctly. For that reason, researchers created an observation sheet regarding module delivery to help observers in evaluating the teaching process by the teachers. This observation sheet contained 12 assessment points.

The module as a learning tool was developed in a systematic and interesting manner to be able to achieve the expected competencies according to the level of complexity. The results of the evaluation in this study presented that learning using this module could help students to improve their understanding, achieve minimum comprehensiveness criteria, to bring students to be actively involved in learning activities, and familiarize students to find concepts in independent learning activities.[28,35] The application of the module was able to condition learning activities to be more well planned, independent, and comprehensive with clear

results.[28]

Integrated learning is an approach to develop students 'knowledge based on interactions with life experiences in accordance with students' interests and needs.[29] In line with Howorth's[32] opinion, students who have an interest towards the module will learn more contents, enjoy, and have a better understanding of the materials. The results of this study indicated that the effective implementation of integrated reproductive health learning modules can improve students' learning motivation. Learning satisfaction theory by Cardozo[33] mentioned learning satisfaction as the result of a comparison between expectations and services that are felt with a sense of pleasure or not happy. A person will feel satisfied if expectations are in accordance with reality and feel dissatisfied if something is not in line with their expectations. Learning satisfaction shows students 'feelings and attitudes towards learning activities and can affect students' motivation and behavior.[34] For that, it requires a change in learning techniques to achieve expectations that are in accordance with the needs of students in order to improve student learning satisfaction.

Measurement of learning satisfaction according to Parasuraman et al.'s[31] theory consists of five dominant factors of service quality determinants which are then proxied to assess student learning satisfaction when learning using the integrated reproductive health learning module. Indicators of learning satisfaction were based on reliability, responsiveness, assurance, empathy, and tangibility.

This study revealed that student satisfaction in the treatment group increased by 6.23% compared to the control group that showed a

negative gap between perceived services with desired expectations of 6.1%. This difference in learning satisfaction was statistically very meaningful with p≤0.001, meaning that the application of integrated reproductive health learning module was able to improve student learning satisfaction. According to Hasan et al.,[38] one of the problems seen in education is the difficulty of maintaining student motivation and interest in obtaining good academic achievement at school. More and more students are becoming less interested in learning when they enter junior high school and will be increasingly unmotivated when entering senior high school.

Students' learning satisfaction increased in 111 students (62%) in the treatment group while in the control group, the increase was only seen in 68 students (38%) out of 179 students. The presence negative gaps seen in the control group reflects a condition that the perceived learning still cannot meet the expectations of students. The effect on satisfaction may come from the different learning approaches and strategies applied in the national 2013 curriculum and integrated reproductive health modules.

Conclusions

The use of integrated reproductive health learning module significantly influences student's motivation and learning satisfaction among seventh grade junior high school students.

Conflict of Interest

The authors declare no conflict of interest.

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RESEARCH ARTICLE

The Role of Fibroblast Growth Factor Receptor 3 (FGFR3) and Androgen Receptor (AR) in a Non-invasive Urothelial Carcinoma Recurrences

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Abstract

Urothelial carcinoma is a bladder carcinoma that took place in the urinary tract. Non-invasive urothelial carcinoma patients have high recurrence rates (50–70%). The recurrences took so many years that may lead to the high-cost treatment and low survival rate. Fibroblast growth factor receptor 3 (FGFR3) and androgen receptor (AR) known to play a role in non-invasive urothelial carcinoma and potentially act as a prognostic marker to predict recurrences. This study aimed to discover the role of FGFR3 and AR in recurrences of non-invasive urothelial carcinoma. This research used a case-control study design. Samples took from patients diagnosed with non-invasive urothelial carcinoma registered at Dr. Hasan Sadikin General Hospital Bandung 1 January 2010–30 December 2015 period. Sixty samples consisted of 30 recurrent groups, and 30 non-recurrent groups individually fixated and embedded to paraffin block for FGFR3 and AR immunohistochemistry analysis. Analysis chi-square performed with a level of confidence 95% and statistical power 95%. p values<0.05 were considered to be statistically significant. Statistical analysis showed that FGFR3 immunoexpression was found significantly low on the recurrence group (p=0.002, OR=5.50). While AR immunoexpression was found insignificant (p=1.000, OR=1.00). FGFR3 immunoexpression from samples in the recurrent group with multiple tumors found to be significantly low (p=0.031, OR=6.067). This study showed that recurrences took place when FGFR3 lowly expressed within non-invasive urothelial carcinoma samples with multiple tumors. This finding may raise a candidate to early-predict the recurrence, thus will suggest early therapy.

Key words: AR, FGFR3, non-invasive urothelial carcinoma, recurrence

Peranan *Fibroblast Growth Factor Receptor 3* (FGFR3) dan Reseptor Androgen (RA) terhadap Kejadian Rekurensi pada Karsinoma Urotelial Buli Non-invasif

Abstrak

Karsinoma urotelial merupakan karsinoma buli yang sering terjadi pada saluran kemih. Karsinoma urotelial dibagi menjadi karsinoma urotelial non-invasif dan invasif. Pasien karsinoma urotelial non-invasif mempunyai kejadian rekurensi tinggi (50–70%) dan membutuhkan waktu lama untuk memantau kejadian rekurensi sehingga membutuhkan biaya tinggi dengan angka ketahanan hidup rendah. *Fibroblast growth factor receptor 3* (FGFR3) dan reseptor androgen (RA) berperan dalam terjadinya karsinoma urotelial non-invasif dan berpotensi sebagai penanda prognostik yang memprediksi rekurensi secara akurat. Tujuan penelitian ini mengetahui peranan FGFR3 dan RA terhadap kejadian rekurensi pada karsinoma urotelial non-invasif. Penelitian menggunakan rancangan *case-control study*. Sampel berupa blok parafin yang diagnosis sebagai karsinoma urotelial non-invasif di RSUP Dr. Hasan Sadikin Bandung periode 1 Januari 2010–30 Desember 2015. Sebanyak 60 sampel dievaluasi terdiri atas 30 sampel kelompok rekurensi dan 30 kelompok tidak rekurensi. Pemeriksaan imunohistokimia menggunakan antibodi FGFR3 dan RA. Analisis menggunakan uji *chi-square* dengan taraf kepercayaan 95% dan kuasa uji (*power test*) 95%. Nilai p<0,05 dianggap signifikan secara statistik. Pada analisis statistik, imunoekspresi FGFR3 rendah signifikan pada kelompok rekurensi (p=0,002; OR=5,50) dan imunoekspresi RA tidak signifikan (p=1,000; OR=1,00). Imunoekspresi FGFR3 rendah dengan tumor multipel signifikan pada kelompok rekurensi (p=0,031; OR=6,067). Hasil penelitian menunjukkan bahwa rekurensi terjadi ketika FGFR3 terekspresi rendah pada sampel karsinoma non-invasif dengan tumor multipel. Hal ini dapat menjadi penanda memprediksi kejadian rekurensi sehingga dapat dilakukan terapi yang lebih cepat.

Kata kunci: FGFR3, karsinoma urotelial non-invasif, RA, rekurensi

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Introduction

Bladder carcinoma is the most common malignancy occurring in the urinary tract, and 3 to 4 times more likely to develop in men than women. Bladder carcinoma takes place in the urinary tract, which originated from bladder transitional epithelial cell.[1–3] In Indonesia, bladder carcinoma is the seventh most common carcinoma with an occurrence rate of 5.8 in every 100,000 people/year and mortality rate of 3.1 in every 100,000 people/year.[4] According to Dr. Hasan Sadikin General Hospital Bandung medical record, urothelial bladder carcinoma was ranked the fourteenth most common malignancy with 86 cases recorded in 2016.

Urothelial carcinoma is the most often type of bladder carcinoma with occurrence rates 80–90% of all bladder carcinoma cases.[1,2,5] Clinically, urothelial carcinoma classified into two groups based on muscle invasion degree, which are non-invasive and invasive urothelial carcinoma. The most commonly diagnosed carcinoma is the non-invasive or superficial urothelial carcinoma or non-muscle invasive bladder cancer (NMIBC), around 70–80% of patients. Non-invasive bladder urothelial carcinoma also classified into a low and high degree of non-invasive papillary urothelial carcinoma (pTa); in situ urothelial carcinoma (pTis); and infiltrating urothelial carcinoma which has invade lamina propria (pT1).[2,3,6–11]

The therapy for non-invasive bladder urothelial carcinoma is transurethral resection of the bladder tumor (TURBT) followed by intravesical chemotherapy or immunotherapy. Although patients have undergone therapy, the recurrence rate is still around 50–70% in a year and could reach 31–78% in 5 years. In 15–25% non-invasive urothelial carcinoma cases can progressively evolve to an invasive urothelial carcinoma.[10]

Recurrences defined as relapse carcinoma post-initial resection and histopathologically confirmed.[12] Clinically, predictive factors that may cause recurrences are the tumor amount, tumor size, prior recurrence state, in situ coexistent carcinoma, pathological stages, and degree of histopathological. These predictive factors are utilized to stipulate the recurrences through a scoring system and risk table calculation, performed on first and fifth-year post-therapy. Hence a molecular marker is required to anticipate recurrences on non-invasive bladder urothelial carcinoma.[10,13]

Genetic evidence shows that urothelial carcinoma can develop from two molecular pathways: FGFR3, which play a significant role in non-invasive bladder urothelial carcinoma; and TP53. FGFR itself is a high-affinity tyrosine kinase transmembrane receptor that is important for embryogenesis, cell growth, differentiation, proliferation, and angiogenesis. FGFR has 4 active isoforms, which are FGFR1, FGFR2, FGFR3, and FGFR4. FGFR3 signaling pathway particularly can activate the androgen receptor (AR) activity.[1,11,14–16]

Androgen receptor (AR) is an intracellular steroid hormone receptor found in cytoplasm or nucleus. It has a role in causing urothelial bladder carcinoma through the genomic and non-genomic pathway, for example, through FGFR3 pathway.[15] Androgen receptor found majorly expressed on urothelial carcinoma cases (44–78% of cases) while it is not expressed in benign urothelium tumor.[3,17]

In recent years, several studies have been carried out on FGFR3 and AR in urothelial bladder carcinoma, and the results reported are varied and controversial. A study of van Rhijn et al.[18] reported that the FGFR3 mutation was a predictive of recurrence in low and high degree urothelial carcinoma. Nam et al.[12] reported that in univariable analyzes AR expression was lower in recurrence. In multivariate analysis, there is a significant relationship between AR expression with low recurrence.

The objective of this study is to understand the role of FGFR3 and AR in recurrent non-invasive urothelial carcinoma, thus can early-anticipate the recurrence possibility and help to conduct proper treatment.

Methods

Samples were taken from TURBT surgery patients biopsy tissue. Patients registered at Dr. Hasan Sadikin General Hospital Bandung, and histopathologically diagnosed with non-invasive urothelial carcinoma period 1 January 2010–30 December 2015. Sixty samples were acquired, which then divided into two groups: the recurrent group (n=30) and non-recurrent group (n=30). Tissue samples were then fixated and embedded to paraffin block for FGFR3 and AR immunohistochemistry staining procedure in each group.

Mouse monoclonal antibody FGFR3 (Santa Cruz, B-9, SC-13121, USA) with 1:100 dilution,

and human AR monoclonal antibody (Santa Cruz, 441, SC-7305, USA) with 1:50 dilution used in standard immunohistochemistry (IHC) staining procedure. FGFR3 immunoexpression rated and scored by calculating the number of cells showed immunoreactivity, which was the cytoplasm-stained cells. AR immunoexpression was the nucleus-stained cells. Distribution score was explained as 0=negative; 1≤10%; 2=10–50%; 3=50–80%; and 4≥80%. Intensity score was explained as 0=negative; 1=weak; 2=medium; 3=strong.19 Histoscore (distribution x intensity) was interpreted as ≥6=high; and <6=low. IHC staining result was examined by two experts in the IHC technique using light microscope Olympus CX31.

Data obtained from this research analyzed with chi-square test for a significant difference. A significant difference interpreted from p-value with $p \leq 0.05$ statistical significant difference, while $p \geq 0.05$ showed otherwise. Odds ratio (OR) used to measure the association between exposure and outcome. In this research, it was the association between FRGR3 and AR immunoexpression;

and non-invasive bladder urothelial carcinoma recurrences. The data attained from laboratory procedure recorded in distinct form and SPSS 24.0 for Windows used to analyze the data.

Samples attained after approval by the Health Research Ethics Committee, Faculty of Medicine, Universitas Padjadjaran Bandung with assessment letter number: 73/UN6.KEP/EC/2018.

Results

Characteristics of research subjects used based on epidemiology are age, sex, and smoking risk factors. Based on recurrence prediction factors used by the European Association of Urology (EAU) consisting of tumor size, the number of tumors, pathological stage, and histopathological degree. The results of the comparative analysis of the characteristics of the recurrence and non-recurrence groups showed no differences in the characteristics of the two groups at the beginning of the study.

The results of the FGFR3 immunoexpression

Table 1 Comparison between Research Participant Characteristic on Recurrent and Non-recurrent Group

Variables	Groups		p Value
	Recurrent (n=30)	Non-recurrent (n=30)	
Age (years) Mean±Std	59.56±12.133	60.00±12.982	0.894
Sex			
Male	24	28	0.254
Female	6	2	
Smoking risk factor			
Yes	22	25	0.347
No	8	5	
Tumor size			
≥3 cm	18	12	0.121
<3 cm	12	18	
Number of tumor			
Single	12	20	0.038
Multiple	18	10	
Pathological stage (T)			
pTa	5	9	0.952
pT1	24	21	
pTis	1	0	
Histological degree			
Low	6	11	0.152
High	24	19	

Table 2 FGFR3 Immunoexpression Histoscore Comparison between Recurrent and Non-recurrent Group

FGFR3 Immuoexpression	Groups		OR CI (95%)	p Value
	Recurrent (n=30)	Non-recurrent (n=30)		
High	10	22	5.50 (1.813– 16.681)	0.002
Low	20	8		

Table 3 AR Immmunoexpression Histoscore Comparison between Recurrent and Non-recurrent Group

AR Immuoexpression	Groups		OR CI (95%)	p Value
	Recurrent (n=30)	Non-recurrent (n=30)		
High	3	3	1.0 (0.185–5.403)	1.000
Low	27	27		

Table 4 Comparison between FGFR3 and AR Immunoexpression Histocores on Patients with Single Tumor on Recurrent and Non-recurrent Group

Variables	Groups		OR CI (95%)	p Value
	Recurrent (n=12)	Non-recurrent (n=20)		
FGFR3 immunoexpression				
High	5	15	0.238 (0.052–1.100)	0.059
Low	7	5		
AR immunoexpression				
High	0	1	0.000	1.000
Low	12	19		

Table 5 Comparison between FGFR3 and AR Immunoexpression Histoscores on Patients with Multiple Tumor on Recurrent and Non-recurrent Group

Variables	Groups		OR CI (95%)	p Value
	Recurrent (n=18)	Non-recurrent (n=10)		
FGFR3 immunoexpression				
Low	13	3	6.067 (1.107–33.238)	0.031
High	5	7		
AR immunoexpression				
High	3	2	0.800 (0.110–5.819)	1.000
Low	15	8		

histoscore category showed p value<0.05 (p=0.002), while the AR immunoexpression histoscore category obtained p>0.05 (p=1.000). The results between FGFR3 and AR immunoexpression histoscore on patients with single tumors characteristic on recurrent
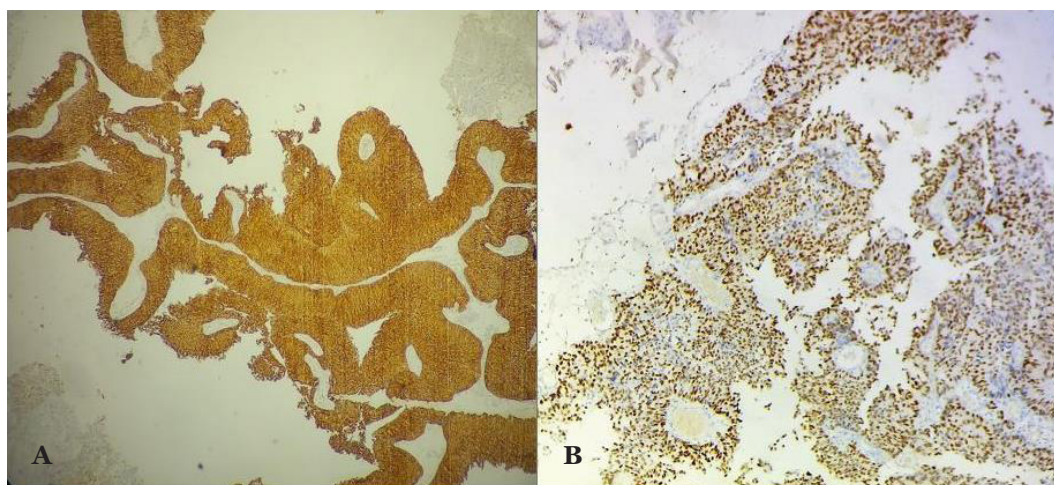
Figure (A) Immunoexpression FGFR3 and (B) Immunoexpression AR with Strong Intensity. Original Magnification, ×400

and non-recurrent groups obtained p>0.05 (p=0.059 for FGFR3 and p=1.000 for AR), which means not significant, whereas FGFR3 immunoexpression histoscore with multiple tumor characteristic obtained p values<0.05 (p=0.031) which means statistically significant, while AR immunoexpression histoscore with multiple tumor characteristic obtained p>0.05 (p=1.000) which means it is not significant.

Statistical analysis result on research groups showed that both groups were homogenous, which means both groups were feasible to be compared and perform a further statistical hypothesis test, the only number of tumor that will alter the result between both groups (Table 1).

Statistical analysis showed that there was a significant difference in FGFR3 immunoexpression proportion between the recurrent and non-recurrent group. Odds ratio value from the test showed that patients with low FGFR3 immunoexpression are 5.5 times more likely to suffer from recurrence compared to patients with high FGFR3 immunoexpression (Table 2).

Statistical analysis showed that there was no significant difference in AR immunoexpression proportion between the recurrent and non-recurrent group. Odds ratio value from the table above showed that patients with low AR immunoexpression are one time more likely to suffer from recurrence compared to patients with high AR immunoexpression (Table 3).

Statistical analysis showed that there was no statistically significant difference between FGFR3 and AR immunoexpression proportion; and single tumor characteristic on the recurrent and non-recurrent group (Table 4).

The result showed that there was a statistically significant difference in proportion between patients with low FGFR3 immunoexpression and multiple tumor characteristic on the recurrent and non-recurrent group. From the odds ratio, patients with low FGFR3 immunoexpression on multiple tumors are 6.067 times more likely to suffer from recurrence compared to patients with high FGFR3 immunoexpression. AR immunoexpression variable found to have no statistical (Table 5).

Discussion

Urothelial carcinoma is the most common bladder malignancy, with around 90% of all cases. Most bladder carcinoma incidence occurs in men in the age above 50, with smoking as the primary risk factor.[20] The finding goes parallel with this research, where 86.7% of patients are male around the age of 59.78±12.460, and 78.3% were smoking.

Non-invasive bladder urothelial carcinoma has a high recurrence rate, which is 50–60%, and likely to develop into progressive (state of) carcinoma around 15–25% in 5 years. Urothelial carcinoma originated from urothelium cancer stem cell which distributed to urothelium through migration. It behaves like a multifocal tumor, and result in recurrences. There are four reasons why

recurrences take place in urothelial carcinoma. They are incomplete resection on primary urothelial carcinoma; tumor cell reimplantation; unknown tumor cells when the primary tumor resection occur; and a new tumor formation.[21,22]

In this study, we found that patients in the recurrent group have statistically significant low FGFR3 immunoexpression (p=0.002) with OR 5.50 and CI (1.813–16.681). FGFR3 might play a significant role in non-invasive bladder urothelial carcinoma recurrence. In summary, the possibility of recurrences took place in non-invasive bladder carcinoma patients with low FGFR3 immunoexpression is 5.5 times compared to patients with high FGFR3 immunoexpression.

Results attained in this research are in line with the research conducted by van Rhijn et al.,[18] which stated that low FGFR3 expression is a strong indicator in non-invasive bladder carcinoma recurrences. The assumed recurrences caused by the remaining cancer stem cells that were still intact on the primary tumor site after primary tumor resection. On the low FGFR3 immunoexpressed tumor, cancer stem cells suspected of undergoing a slower proliferation rate. They also act as weak cell-cell interaction and poor stromal strength, altogether causing tumor cells to reimplant in the bladder epithelium easily. They migrated to inside the epithelium as well as leading to trouble-free stromal invasion. Patients with low FGFG3 immunoexpression are likely to experience recurrences in numerous sites and multiple growths.

On AR IHC staining analysis, p-value attained was 1.000 with OR 1.0 and CI (0.185–5.403), which showed that no significant difference in the proportion of AR expression between the recurrent and non-recurrent group. These results similar to results by Miyamoto et al.[19] and Mir et al.,[24] which discovered that 12.9% of samples (61 cases out of 472) were positive AR immunoexpression. Only 9.0% detected on non-invasive bladder carcinoma, and 15.1% detected on invasive bladder carcinoma. There was no difference in (AR) expression between male and female patients, and no statistically significant difference in urothelial carcinoma recurrences. There are some dissimilarities between the result from this research and other research, due to the variation in IHC expression and biological function. IHC method has a threshold in approaching (detecting) cells that express the corresponding protein. Thus there might be

a chance that the IHC technique reveals false-negative results because the samples express the insufficient amount of AR to be detected, which the AR did express.[6,19,24,25]

Based on the bivariate analysis test, FGFR3 and AR simultaneously do not affect recurrence events, and only FGFR3 is related to recurrence events. It suggested that the role of AR in bladder urothelial carcinoma through non-genomic pathways with activation of FGFR3 does not occur due to low FGFR3 immunoexpression. Inactive AR causes inactivate gene transcription in the cell nucleus, which further proliferates urothelium cells. The process causes epithelial cell hyperplasia to atypia, then to dysplasia and finally to urothelial carcinoma occurrence.

According to Table 1, there was a statistically significant difference in the number/amount of tumor characteristic between the recurrent and non-recurrent group. For that reason, the chi-square test performed on FGFR3 immunoexpression category. Fisher Exact test used to analyze the AR immunoexpression category. We can compare the FGFR3 and AR immunoexpression histoscore on patients with single and multiple tumors characteristic on the recurrent and non-recurrent group. In our study, we found that there was no statistically significant difference in the proportion of FGFR3 and AR immunoexpression variable on patients with single tumor characteristic on the recurrent and non-recurrent group with p value>0.05.

Comparison between FGFR3 and AR immunoexpression histoscore on multiple tumor characteristic patients, on the recurrent and non-recurrent group, revealed that there was a statistically significant difference in proportion between the FGFR3 immunoexpression variable and multiple tumor characteristic on the recurrent and non-recurrent group (p=0.031) with OR 6.607 and CI (1.107–33.238). The opposite result obtained from AR immunoexpression variable, where there was no statistically significant difference with a p value>0.05.

Multiple tumors have an unstable genetic characteristic, and the loss of cell adhesion will cause the intraepithelial migration of tumor cells. There were two theories proposed to explain the multifocality in urothelial carcinoma. The first theory, the monoclonal theory, which elaborates that multiple tumors rise from one progenitor cell that undergoes sort of changes. They proliferate and spread to the whole urothelium through

intraluminal implantation or intraepithelial migration. Tumor cells extravasation from the primary site followed by tumor cell implantation in the different urothelium area leading to intraluminal tumor seeding. Intraepithelial spreading occurs through continuous migration and cell proliferation which distributed to the whole urothelium. Second theory, the "field cancerization" effect; the carcinogen exposure causes the simultaneous genetic alteration on various primary urothelial layer. It resulted in the new multiple tumors which have no genetic correlation.[9,23]

Conclusion

Non-invasive urothelial carcinoma patients with multiple tumor characteristic which has low FGFR3 immunoexpression (histoscore<6) are more likely to suffer from recurrence compared to patients with high FGFR3 immunoexpression. Tumor multiplicity is an essential predictive factor in recurrences on non-invasive bladder urothelial carcinoma.

Conflict of Interest

All the authors state that they have no conflict of interest in this article.

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RESEARCH ARTICLE

Effect of Topical Noni (*Morinda citrifolia* L.) Leaf Extract Paste in Carrageenan-induced Paw Edema on Wistar Rats

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Abstract

The inflammatory response is one of natural process in the body to protect itself following tissue injury, but it can cause discomfort. Noni (*Morinda citrifolia* L.) leaf known as a traditional medicament to help reduce the inflammatory effect. The leaves empirically applied as a wrapping on fever or wound. The purpose of this study was to identify the anti-inflammatory effect of topical noni leaf extract paste in 5% and 10% concentration by examination of Wistar rat paw edema induced by λ-carrageenan. Twenty-four Wistar rats divided into four groups, which were negative control, positive control with diclofenac sodium 1% gel, 5% noni leaf, and 10% noni leaf paste groups. Paw edema was induced by intraplantar injection of 1% λ-carrageenan to every rat. Every treatment subsequently applied in the plantar area before injection, and the changed paw volume measured with plethysmometer at minutes 0, 30, 60, and 90. This study was at the Animal Laboratory, Faculty of Medicine, Universitas Jenderal Achmad Yani, Cimahi city in October–December 2017. The result displayed that the minimum volume after 90 minutes was on 5% and 10% noni leaf paste group, which is 1.00 mL. Kruskal-Wallis test result of inflammatory percentage was significantly different among every group in each examination time ($p<0.05$). Post-hoc test showed that inflammatory reduction on paw edema with noni leaf paste application on both concentrations were significantly different compared to the negative control. However, it was not different from the positive control group. This study showed that application of noni leaf paste in 5% and 10% concentration could help reduce inflammatory response on skin possibly by the active anti-inflammatory ingredients of noni leaf.

Key words: Inflammatory response, noni leaf, paste formula, paw edema

Efek Pasta Ekstrak Daun Mengkudu (*Morinda citrifolia* L.) Topikal terhadap Edema Kaki Tikus Galur Wistar yang Diinduksi Karagenan

Abstrak

Inflamasi adalah proses alami tubuh untuk melindunginya setelah cedera, namun hal tersebut dapat menyebabkan ketidaknyamanan. Daun mengkudu (*Morinda citrifolia* L.) dikenal sebagai obat tradisional untuk menurunkan efek inflamasi yang secara empiris digunakan untuk mengobati demam dan luka. Tujuan penelitian ini adalah mengetahui efek anti-inflamasi pasta ekstrak daun mengkudu melalui pemeriksaan edema kaki tikus yang diinduksi karagenan-λ. Dua puluh empat tikus galur Wistar dibagi menjadi 4 kelompok, yaitu kontrol negatif dengan akuades, kontrol positif (aplikasi gel Na diklofenak 1%), serta perlakuan pasta daun mengkudu 5% dan 10%. Edema dibuat dengan menginjeksi intraplantar tikus dengan 1% karagenan-λ pada tiap kelompok. Tiap-tiap perlakuan diaplikasikan sebelum tikus diinjeksi dan perubahan volume kaki tikus diukur dengan pletismometer di menit ke-0, 30, 60, dan 90. Penelitian ini dilakukan di Laboratorium Hewan, Fakultas Kedokteran, Universitas Jenderal Achmad Yani, Kota Cimahi pada Oktober–Desember 2017. Hasil pengukuran memperlihatkan penurunan volume edema kaki terkecil setelah 90 menit pada kelompok pasta daun mengkudu 10%, yaitu 1,00 mL. Hasil Uji Kruskal-Wallis terhadap persentase inflamasi berbeda nyata pada tiap kelompok dan tiap waktu pengamatan ($p<0,05$). Hasil uji beda menunjukkan bahwa penurunan inflamasi kaki tikus pada perlakuan pasta daun mengkudu kedua konsentrasi berbeda nyata dibanding dengan kontrol negatif, tetapi tidak berbeda dengan kontrol positif. Penelitian ini menunjukkan bahwa pasta daun mengkudu 5% dan 10% dapat membantu menurunkan reaksi inflamasi kulit dan efeknya sejalan dengan Na diklofenak karena zat aktif yang bersifat anti-inflamasi dalam daun mengkudu.

Kata kunci: Daun mengkudu, edema kaki tikus, formula pasta, respons inflamasi

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Introduction

Inflammation is a natural response of the tissue once interact with the source of injuries such as a microorganism, foreign bodies, or physical trauma. Acute and chronic inflammation are two general types of response. Clinically, five cardinal signs of acute inflammation related to inflammatory response pathophysiology, are redness, swelling or edema, fever or warmness, pain, and loss of function. These signs related to the vascular and cellular reaction following the interaction between tissue and injury cause. One of the primary purposes of the inflammatory response is to localize the injury and avoid spreading of microbial agents. The clinical reaction of this response can cause pain, discomfort, or disability. To reduce these unwanted effects, we commonly use anti-inflammatory medication.[1–3]

Indonesia is a tropical country where using herbal medicine that considered one of its tradition and an essential part of the culture. Noni (*Morinda citrifolia* L.) is a plant grown in any part of Indonesia. Its leaf empirically used for healing wounds and boils by crushing, heating, spreading as well as strapping it to the wound area. Many active constituents in noni leaves responsible as antibacterial, anti-inflammatory, antioxidant, and astringent.[4–7]

The acute inflammatory process begins with releasing mediators triggered by trauma or invasion of foreign material to the body. Edema is one of the signs of the inflammatory response which would be visible in a few minutes. It will follow by short vasodilation and vasoconstriction of the affected area and decreases when inflammatory reaction ceased. The mediators washed by recovering capillary blood flow.[1,7]

Previous research showed that topical application of noni leaves in dry and ethanol extract could also promote healing in Wistar rat skin and oral mucosa wound. Through analysis of fibroblast cell count, the diameter of wound reduction, new capillary formation in connective tissue, and inflammatory cells examination. Based on our previous research, the concentration of noni leaf ethanol extract, which was effective on skin and oral mucosa wound healing was in 10% concentration. The paste formula resulted in the most significant wound closure condition as well as inflammatory cells in the wound healing process compared to control was 5% and followed by 10% concentration.[8–11]

This research was performed to examine the effect of topical noni leaf ethanol extract in 5% and 10% paste to an inflammatory response in rat plantar area edema induced by λ-carrageenan.[12] Wistar rats used as connective tissue and skin inflammation model in vivo. In this study, ethanol extract of noni leaves formulated into a topical paste. The purpose of the studies eventually is to create topical medication for oral mucosa wound with low toxicity and in the practically better formula to encourage wound healing.

Methods

The research was carried on from October to December 2017 at Animal Laboratory of Faculty of Medicine, Universitas Jenderal Achmad Yani, Cimahi city. Twenty-four Wistar rats (*Rattus norvegicus*) were used as the inflammation model after received ethical clearance from the Health Research Ethics Committee of Dr. Hasan Sadikin General Hospital, Bandung city (No. 924/UN6.C1.3.2/KEPK/PN/2016). The noni leaves were also obtained from Cimahi city and processed as a paste at Pharmacy Laboratory of Faculty of Science, Universitas Jenderal Achmad Yani, Cimahi city.

Twenty-four Wistar rats were used in this study to represent edema as a clinical inflammatory reaction. Before the treatment, all rat paws measured with plethysmometer for initial tissue volume (Vo). Afterward, each topical treatment (distilled water, noni leaf paste, and diclofenac sodium) applied according to the groups. Paw edema induced by intraplantar injection of 0.1 mL λ-carrageenan 1% in left rear paw. Measurement of paw volume (Vt) was with plethysmometer after every treatment. Carrageenan induction carried out every 30, 60, and 90 minutes.[12–14] The percentage of inflammation measured by the formula, in which, Vo was tissue volume right after induction, and Vt was paw volume after induction.

$$\frac{Vt - Vo}{Vo} \times 100\% = \text{percentage of inflammation}$$

Maceration method used to acquire noni leaves ethanolic extract, which then processed into paste formula. Five kilograms of leaves dried to obtain 1 kg of semisolid leaves. They subsequently processed into powder, which was ready to be made ethanolic extract using 96% of ethanol. The powder was put into a macerator

and left for 24 hours, so all the powder become liquid extract. Next, rotary evaporator used to evaporate the liquid to thicken the extract. The result is a thick dark green ingredient of pure ethanolic extract of noni leaves. Noni leaves paste made with the pure ethanolic extract. The extract mixed using a spatula with a paste based formula. The base consists of 20% gelatine, 15% ZnO_2 paste, 2.5 mg of glycerine, 0.5% Sodium benzoate, and water.[15] To make the paste in 5% and 10% concentration, we combined 100 grams base as explained above with 5 grams and 10 grams, subsequently, of pure ethanolic extract of noni leaf. The paste obtained had light-greenish hue with semisolid consistency, which was thicker and hydrophobic compared to gel formula.

Inflammatory cells infiltration count of all groups analyzed using the Kruskal-Wallis test for nonparametric test. The data were not normally distributed according to the normality test result using the Shapiro-Wilk test (p>0.05).[16] Statistical analysis was using a confidence interval of 95% (p<0.05)—the data analysis performed with SPSS

software for Windows.

Results

Examination in 30, 60, and 90 minutes showed that inflammatory response marked by paw edema induction on 5% paste and 10% paste treatment group was reduced quicker compared by the control group. Observation in minute 30 and 60 after carrageenan induction indicated that inflammatory response reduction was better among both noni leaf paste treatment group. However, after 90 minutes of observation, the positive control group with 1% diclofenac sodium also demonstrated a decrement of inflammatory percentage. The lowest inflammatory percentage reduction appeared to be in 10% noni paste group in minute 90. Examination of rat paw edema with plethysmometer showed that on the group with 10% noni leaf paste treatment, the difference between normal paw volume and after 90 minutes of induction was the lowest (Table 1).

Kruskal-Wallis test performed on the data

Table 1 Mean Paw Edema Volume (mL) in Every Observed Minute After Induction with λ-carrageenan

Groups	Normal Volume	30'	60'	90'
Negative control	0.71	1.36	1.36	1.36
Positive control	0.70	1.15	1.26	1.03
5% noni leaf paste treatment	0.76	1.05	1.05	1.01
10% noni leaf paste treatment	0.73	1.10	1.10	1.00

Table 2 Inflammatory Percentage in Minute 30, 60, and 90

Inflammatory Percentage After λ-carrageenan Induction	Mean Rank		p Value*
Minute 30	Negative control	20.50	0.000
	Positive control	16.50	
	5% paste treatment	6.67	
	10% paste treatment	6.33	
Minute 60	Negative control	19.50	0.002
	Positive control	16.50	
	5% paste treatment	7.0	
	10% paste treatment	7.0	
Minute 90	Negative control	21.33	0.001
	Positive control	14.25	
	5% paste treatment	8.42	
	10% paste treatment	6.00	

*Kruskal-Wallis test, p<0.05=significant

**Figure 1   Noni Paste Application on Rat Paw Along with Carrageenan Induction**

Figure 2   Measurement of Paw Volume with Plethysmometer

showed that the reduction of inflammatory percentage on every group had a significant difference ($p<0.05$). On the other hand, Mann-Whitney post-hoc test was significantly different only between both negative and positive control groups with both treatment groups on every observation time, but it was not significant among 5% and 10% paste treatment group.

Discussion

Inflammation is a response of micro vascularized body tissue toward the source of injury. This response, including its vascular and cellular responses, serves as a protector from advanced damage from injuries in the body. The inflammatory response classified as acute and chronic inflammation, which differs from their vascular reactions, cells involved, duration, and occurrence of fibrosis. The acute inflammatory process generally involves mediators. They had a part in vasodilation and increased vascular permeability such as nitric oxide, prostaglandin, histamine, bradykinin, C3a, C5a, and oxygen metabolites. Edema is one of the clinical signs of the acute inflammatory response used as a marker for studies about factors that influenced the inflammatory process. Edema caused by λ-carrageenan induction observed as soon as the
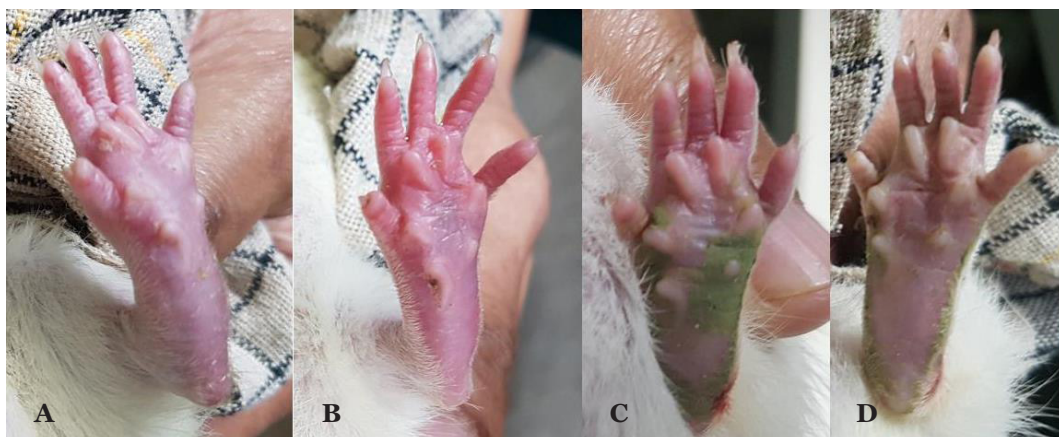
Figure 3   Observation of Rat Paw on Minute 90
(A) Negative control; (B) Positive control; (C) Treatment with 5% noni leaf paste; (D) Treatment with 10% paste

tissue injected.[1,7,12]

Topical preparation is one form of medication generally used in reducing pain or acted as a barrier for the affected area in the skin or mucosa. Anti-inflammatory topical medication, such as diclofenac sodium that used in this study, generally given to alleviate discomfort caused by the inflammatory reaction around the skin or joint. This preparation, as well as the oral administered ones, acted by inhibiting the work of cyclooxygenase enzyme so that the prostaglandin would not be synthesized from arachidonic acid, and also by restraining leucocyte adhesion. The effects caused by thromboxane and prostaglandins supposed to be synthesized, like pain and tissue damage, will also be repressed. Unfortunately, these anti-inflammatory drugs can also cause side effects such as hypersensitivity, GIT disturbance, and vascular disorder which can be life-threatening.[1,3,17]

The use of herbal medicine had been very popular in countries which had a large variety of plants. Studies of herbal medicine are necessary to create an extract that is proven to be beneficial, more practical to use, and possibly has lower side effects. Noni plant (*Morinda citrifolia* L.) is a tropical plant which is very common in Indonesia. The plant can grow in any location since it was relatively durable against high temperature and weather and does not depend on special treatment in a plantation. It commonly grows as a garden tree in towns, although it also found in forests. In Indonesia, many parts of the plant such as fruit and leaves, believed to have the benefit to cure some illness and empirically used as traditional medicine.[4,7,18]

The authors had accomplished some previous studies using ethanol extract of noni leaf. The outcome showed that the topical extract gel formula could help skin and oral mucosa wound to heal faster compared to povidone-iodine solution. The result is from examining wound closure time, CD34 count, acute inflammatory infiltration, and fibroblast cell count on Wistar rats. Topical paste formula of noni leaves ethanolic extract also may accelerate oral mucosa wound healing compared to gel formula. The result is through an examination of wound width, histological appearance of connective tissue, and tissue MDA level on the remodeling phase. The 5% and 10% concentration paste used in this study because our previous study showed that in the 14th day of wound healing, the clinical wound closure was the most significant, compared to 2.5% and 20%

concentration. Other previous studies by Palu,[19] Nayak et al.,[5] and Rasal et al.[6] showed that topical oral administration of ethanol extract of noni was effective on optimal skin wound healing. It also can help mitigate skin erythema induced by UV-B exposure according to the study by West.[20] Antibacterial properties of noni leaves extract against *Staphylococcus aureus*, which related to wound healing as well, had also studied by Kumar et al.[21] in 2010. In vitro study of noni leaf extract on macrophage by Saraphanchotiwitthaya and Sripalakit[22] showed that it had an inhibitory effect to TNF-α compared to dexamethasone and indomethacin.[9–11,19–22]

Noni leaf possesses active constituents, such as flavonoid, xeronine, alkaloids, saponin, tannin, scopoletin, triterpenoids, anthraquinone, iridoid glycosides, and ascorbic acid. Many of it worked on improving the wound healing process, through antioxidant, antibacterial, and anti-inflammatory activity. Studies showed active anti-inflammatory constituent in noni leaf which effects were alkaloids, tannin, xeronine flavonoid iridoid glycosides, and scopoletin. The mechanism of the constituents was to inhibit inflammatory enzyme production such as COX, and matrix metalloproteinases, as well as cytokines.[18–24] Inflammatory percentage examined indicated that topical noni leaf paste used, either in 5% or 10% concentration, had a better anti-inflammatory effect compared to the negative control. It had a similar effect with diclofenac sodium topical gel as a positive control, mainly in the 90 minutes of observation. The result means one of the chemical composition on the noni paste extract reducing the acute inflammatory reaction. The reaction would occur in prolonged time if no medication applied to the edema.

There was a significant difference between the treatment group and negative control group, but there was not any difference between the two treatment groups with noni leaf paste. It suggested that a 5% deviation in the concentration of extract did not influence the anti-inflammatory effect of the noni leaf paste. The result of this study was following our previous studies. 5% noni leaf ethanolic extract paste concentration improved clinical wound closure on the oral mucosa. It improved wound healing by histopathologic examination of fibroblast and inflammatory cells findings.[9,11,25] According to the findings, we considered improving this study by observing the side effects and a more prolonged period of examination.

Conclusions

This study about the effect of noni leaf in 5% and 10% extract in paste formula on inflammatory response marked by paw edema indicated that it could reduce inflammatory response similar to the effect of diclofenac sodium 1% topical gel as a standard prescription for inflammatory reaction externally. The result which was statistically significant and yet better than negative control, could be a base for further research on inflammatory response, for example by measuring inflammatory rate with other methods in vivo, try other dosage possible according to previous studies, examination of side effects, as well as considering the study on other form of injury such as burns or vesicles.

Conflict of Interest

There is no any conflict of interest in this study nor in the information stated in this article.

Acknowledgments

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RESEARCH ARTICLE

Reliability and Validity Test of the Indonesian Version of the Nordic Musculoskeletal Questionnaire (NMQ) to Measure Musculoskeletal Disorders (MSD) in Traditional Women Weavers

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Abstract

Musculoskeletal disorder remains to be a health and safety problem. One of measuring instrument often use to assess musculoskeletal disorders worldwide is the Nordic musculoskeletal questionnaire (NMQ). This questionnaire translated into various languages and tested for its validity and reliability. However, it has limitations, such as the difficulty of application in countries that do not speak English. This study aims to test the validity and reliability of the Indonesian version of NMQ in women weavers working using traditional handlooms in East Kalimantan Indonesia from March to May 2018. The validity of items obtained ranges 0.501 (min.) to 0.823 (max.), and Cronbach's alpha reliability was 0.726. In conclusion, the NMQ in Indonesian version has satisfactory psychometric properties with adequate validity and reliability.

Key words: Musculoskeletal disorders, NMQ in Indonesian, reliability, validity

Uji Validitas dan Reliabilitas *Nordic Musculoskeletal Questionnaire* (NMQ) Versi Indonesia untuk Mengukur Gangguan Muskuloskeletal pada Penenun Tradisional Wanita

Abstrak

Gangguan muskuloskeletal masih menjadi masalah kesehatan dan keselamatan kerja. Salah satu alat ukur yang sering dipakai untuk mengkaji gangguan muskuloskeletal di seluruh dunia adalah *Nordic musculoskeletal questionnaire* (NMQ). Kuesioner ini telah diterjemahkan ke berbagai bahasa di dunia dan terbukti valid serta reliabel, tetapi memiliki keterbatasan di antaranya sulit diaplikasikan di negara yang tidak menggunakan bahasa Ingris sebagai bahasa sehari-hari. Penelitian ini bertujuan menguji validitas dan reliabilitas NMQ versi bahasa Indonesia pada penenun tradisional wanita di Kalimantan Timur periode Maret sampai Mei 2018. Didapatkan hasil uji validitas item berkisar antara 0,501 (min.) sampai 0,823 (maks.) dan indeks reliabilitas *Cronbach's alpha* sebesar 0,726. Simpulan, NMQ versi bahasa Indonesia cukup valid dan reliabel untuk mengukur gangguan muskuloskeletal.

Kata kunci: Gangguan muskuloskeletal, NMQ berbahasa Indonesia, reliabilitas, validitas

Introduction

Musculoskeletal disorders (MSD) is a condition that can affect any part of the musculoskeletal system. It includes the muscles, bones, nerves, joints and spinal discs, along with supporting blood vessels and connective tissues such as tendons, ligaments, and cartilage. The symptoms, including pain, numbness, tingling, aching, stiffness, or burning.[1,2] Musculoskeletal disorders have become increasingly prevalent worldwide during the past decade.[3] It not only affects the workers' quality of life but also imposes a significant economic burden to the society.[4] It also has a high health cost, and it constitutes a significant cause of occupational injury and physical disability in both developed and developing countries.[5]

MSD occurs in various industries, both formal and informal sectors. High-risk occupation including construction, agriculture, manufacturing, wholesale and retail trade, and human health and social work.[5] Risk factors related to MSD include heavy physical work, forceful overexertion, awkward and sustained postures, repetitive movement, and vibration.[6] A systematic review by da Costa and Vieira[7] proposed that several biomechanical, psychosocial, and individual factors contributed to the occurrence of work musculoskeletal disorders (WMSD).

The syndrome of musculoskeletal work disorders includes pain and stiffness in various regions of the body like neck, shoulder, lower back, wrist, hand, and fingers.[8] Based on various typical complaints, experts have compiled various instruments/questionnaires to examine the subjective complaints of WMSD.[9] One of measuring instrument that is often used to assess musculoskeletal disorders worldwide is the Nordic musculoskeletal questionnaire (NMQ). With the support of the Nordic Council of Minister, the NMQ developed to create a simple, standardized questionnaire. It should be able to be used to detect and analyze musculoskeletal symptoms of different individuals in different parts of the body.[10]

The NMQ has several advantages over other measuring instruments. Some of them are: standardized questions, worldwide recognition, its free, provide self-evaluation, and relatively quick identification of the symptoms. It also has applicability in large populations and frequent use together with other evaluation methods such as rapid upper limb assessment (RULA), rapid entire body assessment (REBA) and Ovako working posture analysis system (OWAS). However, NMQ also has limitations, among them is the difficulty of application in countries that do not speak English (for errors in translation, interpretation, and or validation) and restriction of exhaustive questions to three areas of the body (lower back, neck, and shoulders).[11]

The NMQ has been translated into various languages and occupation and tested for its validity and reliability.[4,8,12–16] However, the literature that discusses the results of the NMQ translation, validity, and reliability test in the Indonesian version is still limited. This study aims to simplification and translating NMQ into the Indonesian version. The make the NMQ accessible for the use in the Indonesian setting. Its validity and reliability tested in women weavers working using traditional handlooms in East Kalimantan Indonesia.

Methods

The study was on 50 "Samarinda Sarong" women weavers who work using traditional handlooms in Samarinda, East Kalimantan, Indonesia from March to May 2018. The traditional weaving "Samarinda Sarong" is one of Samarinda city tourism icons, which until now maintained because it is considered to have artistic value and high origin.

The NMQ[10] is in two well-differentiated structures. The first part, the general one, refers to symptoms in 9 parts of the body (neck, shoulders, elbows, wrists/hands, upper back, lower back, hip/thighs, knees, and ankles/feet) during the last 12 months/7 days. The second part, the specific one, refers to symptoms in three parts of the body (neck, shoulders, and lower back) throughout the subject's working life/7 days beforehand. To answer this questionnaire, the subjects were asked to answer "yes" or "no" to the following question: "Have you any time during the last 12 months had trouble (ache, pain, discomfort) in— followed by a list and body diagram of the nine different anatomical areas. If the respondent marked "yes", then the respondent was asked to answer the question "Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?" and "Have you any trouble at any time during the last 7 days?" (Figure 1).

Data were analyzed by the Statistical Package

for the Social Sciences (SPSS) ver. 21, in order to describe continuous and qualitative variables, mean, standard deviation (SD) and percentage frequency used respectively.

Pearson product-moment correlation used to evaluate the construct validity of the total score of the NMQ per questionnaire is an association with the baseline. NQM Indonesian version considered as 'good to excellent' when $r \geq 0.75$, as 'good' when r ranged between 0.5 and 0.7, as 'fair' when r ranged between 0.25 and 0.50, and as 'little or no relationship' when r was less than 0.25. Cronbach's alpha intraclass coefficient and the 95% confidence interval (CI) of the point estimation calculated for the whole questionnaire. Cronbach's alpha values>0.70 were considered satisfactory.[17–20]

The study was reviewed and approved by the Health Research Ethics Committee, Faculty of Medicine, Universitas Mulawarman, Samarinda with letter number: 33/KEPK-FK/IV/2018. Informed written consent requested from the participants before their participation.

Results

The majority of respondents in this study were >46–56 years old (34%), the majority of marital status were married (96%), education level is mostly elementary school (graduated 6th grade) (62%), most of the working experience is more than 5 years (80%) and working time is mostly >5–8 hours per day (76%) (Table 1).
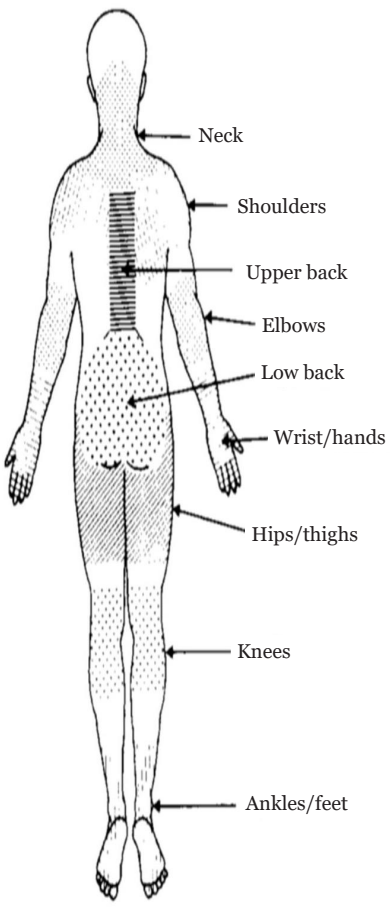
In this study, the NQM original version simplified from the type of chain question to a single question ("Have you at any time during the last 12 months had trouble (ache, pain, discomfort) in"). Whereas, the answer option was changed from "yes" or "no" to a rating with 4 scales, i.e., no pain (A) (scale 0), moderate pain (B) (scale 1), pain (C) (scale 2) and very sick (D) (scale 3). The 28 body regions studied consist of: upper neck, lower neck, left shoulder, right shoulder, left upper arm, back, right upper arm, waist, buttock, bottom, left elbow, right elbow, left lower arm, right lower arm, left wrist, right wrist, left hand, right hand, left thigh, right thigh, left knee, right knee, left calf, right calf, left ankle, right ankle, left foot and right foot.

The question of NMQ and the 28 items/ body region of NMQ translated into Indonesian from the English format producing three separate Indonesia version: one proposed by the author, one by a general medical practitioner,

Table 1 Respondents Characteristics

Variables	Number (n=50)	Percentage
Age (years)		
28–34	10	20
>34–40	8	16
>40–46	7	14
>46–56	17	34
>56–70	6	12
>70	2	4
Marital status		
Not married	2	4
Married	48	96
Education background		
Never went to school/did not graduate elementary school	10	20
Elementary school (graduated 6th grade)	31	62
Secondary high school (graduated 9th grade)	6	12
Senior high school (graduated 12th grade)	3	6
Working experience (years)		
<5	11	20
>5	39	80
Working time per day (hours)		
3–5	9	18
>5–8	38	76
>8–10	3	6

Trouble with the locomotive organs		
Have you at any time during the last 12 months had trouble (ache, pain, discomport) in:	To be answered only by those who have had trouble	
	Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?	Have you any trouble at any time during the last 7 days?
Neck 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
Shoulders 1. No 2. Yes, in the right shoulder 3. Yes, in the left shoulder 4. Yes, in both shoulders	1. No 2. Yes	1. No 2. Yes
Elbows 1. No 2. Yes, in the right elbow 3. Yes, in the left elbow 4. Yes, in both elbows	1. No 2. Yes	1. No 2. Yes
Wrist/hands 1. No 2. Yes, in the right wrist/hands 3. Yes, in the left wrist/hands 4. Yes, in both wrist/hands	1. No 2. Yes	1. No 2. Yes
Upper back 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
Low back (small of the back) 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
One or both hips/thighs 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
One or both knees 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
One or both ankles/feet 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
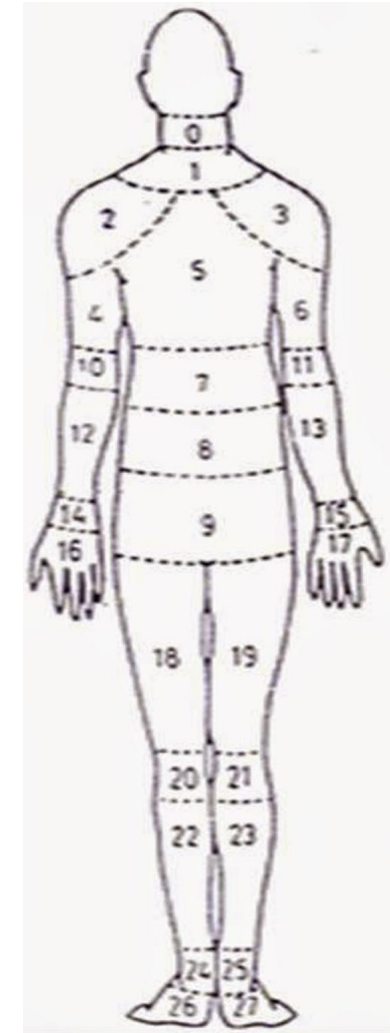
Figure 1 Original Version of Nordic Musculoskeletal Questionnaire (NMQ)

and another by English language expert from Language Laboratory. After going through the analysis/review of content aspects and grammar, three separate translations produced to one single Indonesian version. The final results of the NMQ simplification and translation into Indonesian is in Figure 2.

As shown in Table 2, the mean of the total NMQ score was 15.94 (±8.17). The highest score is from 9th item on "Bottom" (1.62), 8th item on "Buttock" (1.58) and item number 0 on "upper neck" (0.86). The lowest score is from 13th item on the "Right lower arm" (0.12), 7th item on "Waist" (0.14) and 12th item on "Left lower arm" (0.16). The most significant variance observed in item 7 "Waist" (1.266), item 9 "Bottom" (1.138), and item 5 "Back" (1.102); while the smallest variance observed in item 12 "Left lower arm" (0.21). The smallest Pearson correlation is from item number

12 on "Left lower arm" (0.501), item number 10 on "Left elbow" (0.503), and item number 3 on "Right shoulder" (0.510). The highest Pearson correlation is from item number 8 on "Buttock" (0.823), item number 7 on "Waist" (0.752), and item number 5 on "Back" (0.689).

As shown in Table 2 and Figure 1, the Cronbach's alpha as an internal consistency range from 0.707 (lowest) to 0.728 (highest). There are several alternatives to increase the Cronbach's alpha coefficient. With question number 8 "Buttock" deleted this can increase Cronbach's alpha coefficient by 0.726. If question number 10 "Body region of the left elbow" deleted this can increase Cronbach's alpha coefficient by 0.727 and if item question number 11 "Body region of the right elbow" deleted this can increase Cronbach's alpha coefficient by 0.728. However, in general, the combination of all 28 items/

Have you at any time during the last 12 months had trouble (ache, pain, discomfort) in: *(Dalam 12 bulan terakhir ini, apakah anda merasakan nyeri, sakit atau tidak nyaman pada bagian-bagian tubuh di bawah ini):*		Answer *(Jawaban)*			
		A	B	C	D
		0	1	2	3
0	Upper neck *(Leher atas)*				
1	Lower neck *(Leher bawah)*				
2	Left shoulder *(Bahu kiri)*				
3	Right shoulder *(Bahu kanan)*				
4	Left upper arm *(Lengan atas kiri)*				
5	Back *(Punggung)*				
6	Right upper arm *(Lengan atas kanan)*				
7	Waist *(Pinggang)*				
8	Buttock *(Pantat atas)*				
9	Bottom *(Pantat bawah)*				
10	Left elbow *(Siku kiri)*				
11	Right elbow *(Siku kanan)*				
12	Left lower arm *(Lengan bawah kiri)*				
13	Right lower arm *(Lengan bawah kanan)*				
14	Left wrist *(Pergelangan tangan kiri)*				
15	Right wrist *(Pergelangan tangan kanan)*				
16	Left hand *(Tangan kiri)*				
17	Right hand *(Tangan kanan)*				
18	Left thigh *(Paha kiri)*				
19	Right thigh *(Paha kanan)*				
20	Left knee *(Lutut kiri)*				
21	Right knee *(Lutut kanan)*				
22	Left calf *(Betis kiri)*				
23	Right calf *(Betis kanan)*				
24	Left ankle *(Pergelangan kaki kiri)*				
25	Right ankle *(Pergelangan kaki kanan)*				
26	Left foot *(Kaki kiri)*				
27	Right foot *(Kaki kanan)*				

Figure 2 Simplification of the NMQ and Translation into Indonesian Version

body region showed the highest reliability with Cronbach's alpha coefficient of 0.726 (Figure 3). This result generally shows that the Indonesian version of NMQ is reliable to measure MSD.

Based on Table 2 and the previous criteria, the results of the Pearson correlation showed the item number 7 and 8 declared are "excelent" because Pearson correlation (r) more than 0.75, and item number 0, 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 declare are "good" because Pearson correlation (r) ranged from 0.5 to 0.7.

In general, all of the questions are valid to measure MSD in traditional women weavers.

Discussion

The questionnaire, as one of the measuring instruments, must be valid and reliable. Validity measured what is intended to be measured, explains how well the collected data covers the actual area of investigation, and expresses the degree to which a measurement measures what it purports to measure. Reliability concerns the extent to which a measurement of a phenomenon provides stable and consist result, and also

Table 2 Descriptive Characteristics, Cronbach's Alpha Reliability, and the Pearson Correlation of Each Data for Internal Consistency of Indonesian Version of the NMQ (n=50)

Item/Body Region	Mean	SD	Variance	r	p Value	Corrected Item/Total Correlation	Cronbach's Alpha if Item Deleted
Item 0	0.86	0.948	0.898	0.576	0.007	0.153	0.724
Item 1	0.74	0.899	0.809	0.573	0.055	0.383	0.718
Item 2	0.66	0.772	0.596	0.542	0.032	0.355	0.718
Item 3	0.66	0.717	0.515	0.510	0.010	0.351	0.719
Item 4	0.46	0.762	0.580	0.570	0.058	0.444	0.716
Item 5	0.80	1.050	1.102	0.689	0.000	0.487	0.713
Item 6	0.40	0.782	0.612	0.535	0.031	0.404	0.717
Item 7	0.14	1.125	1.266	0.752	0.000	0.570	0.710
Item 8	1.58	0.971	0.942	0.832	0.000	0.093	0.726
Item 9	1.62	1.067	1.138	0.619	0.024	0.494	0.713
Item 10	0.26	0.751	0.564	0.503	0.015	0.007	0.727
Item 11	0.18	0.560	0.314	0.517	0.022	-0.041	0.728
Item 12	0.16	0.468	0.219	0.501	0.016	0.534	0.715
Item 13	0.12	0.328	0.108	0.586	0.006	0.561	0.714
Item 14	0.28	0.607	0.369	0.664	0.001	0.368	0.720
Item 15	0.18	0.482	0.232	0.577	0.007	0.439	0.719
Item 16	0.52	0.839	0.704	0.521	0.023	0.290	0.721
Item 17	0.40	0.670	0.449	0.635	0.002	0.326	0.721
Item 18	0.58	0.785	0.616	0.615	0.003	0.571	0.712
Item 19	0.54	0.762	0.580	0.563	0.056	0.573	0.712
Item 20	0.52	0.814	0.663	0.530	0.012	0.233	0.723
Item 21	0.48	0.789	0.662	0.680	0.000	0.232	0.723
Item 22	0.66	0.848	0.719	0.659	0.001	0.683	0.707
Item 23	0.56	0.787	0.619	0.662	0.001	0.689	0.707
Item 24	0.36	0.563	0.317	0.661	0.001	0.286	0.725
Item 25	0.32	0.471	0.222	0.697	0.000	0.238	0.724
Item 26	0.46	0.706	0.498	0.690	0.000	0.524	0.715
Item 27	0.44	0.675	0.456	0.699	0.000	0.530	0.715
Total score	15.94	8.17	66.751	1	–	1.000	0.834

the degree to which the results obtained by measurement and the procedure can be replicated.[21,22]

The finding indicates that the NMQ in Indonesian version has satisfactory psychometric properties with adequate validity and reliability. It can be used to measure MSD on traditional women weavers. Similar to this study, several efforts translating NMQ into other language is Legault et al.[10] concluded that the French adapted version of the NMQ-E is an appropriate self-administered musculoskeletal symptom screening tool for the adolescent population. Arsalani et al.[23] concluded that adaptation of the NMQ in Iranian version has an acceptable conceptual structure and provides reliable information to measure health condition

(MSD) in Iranian nursing personnel. Mesquita et al.[14] concluded the Portuguese version of the standardized Nordic musculoskeletal questionnaire seems to be valid and revealing good coefficients of reliability to measure MSD in food distribution workers in Portuguese. de Barros and Alexandre[24] concluded that the Brazilian version of the standardized Nordic questionnaire has a firm agreement and substantial reliability. Kahraman et al.[16] argued the Turkish version of the NMQ has appropriate psychometric properties, including good test-retest reliability, internal consistency and construct validity, and can be used for screening and epidemiological investigations of musculoskeletal symptoms. Alaca[25] stated that the Turkish version of the
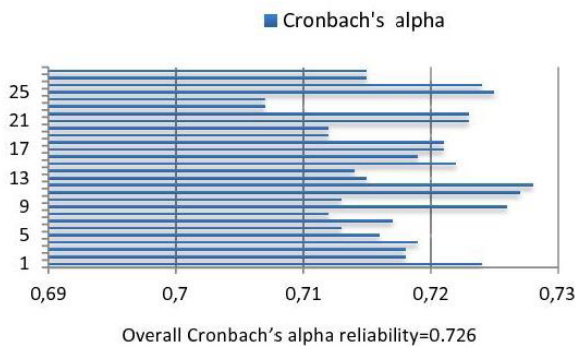
Figure 3 Result of Overall Cronbach's Alpha Reliability Test

NMQ-E showed adequate internal consistency (Cronbach coefficient α=0.78).

Conclusion

The study demonstrates that translating of the NMQ into the Indonesian language fulfills the criteria of a reliable and valid assessment tool to rate the MSD. The high internal consistency and construct validity support the application of the NMQ as an easily administered tool to assess MSD in the Indonesian setting.

Conflict of Interest

The author declare no conflict of interest.

Acknowledgments

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RESEARCH ARTICLE

Folic Acid Usual Doses Decrease the Buccal Micronucleus Frequency on Smokers

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Abstract

Cigarette contains toxic chemical compounds that trigger DNA instability. Initial genotoxic oral cavity characterized by the appearance of micronucleus (MN) in the buccal mucosa. Folate is needed in maintaining DNA stability. This study aimed to compare the effects of folic acid usual doses (400 mcg and 1.000 mcg) on the MN frequency of buccal mucosa in active smokers. It is a clinical trial conducted in November 2018 in the Laboratory of the Faculty of Medicine, Universitas Islam Bandung of 53 active smokers who divided into two treatment groups. Group A was administered by 400 mcg and group B 1,000 mcg folic acid supplementation within three weeks. The buccal mucosa smear stained with hematoxylin-eosin (HE) and observed through a light microscope with 100× and 400× magnification. Data were analyzed by the Wilcoxon test statistically. The results showed that there was a significant decrease (p=0.00) in MN frequency in folic acid supplementation for three weeks, namely group A=6.39±3.92 and group B=6.93±5.82 in pre-supplementation, and group A=3.80±2.66 and group B=3.31±2.71 post-supplementation of folic acid. Giving a dose of 400 mcg and 1,000 mcg for three weeks did not provide significant results (p=0.94) with Kruskal-Wallis test. In conclusion, administration of folic acid at usual dose give results to a decrease in the buccal mucosa MN frequency in active smokers.

Key words: Active smokers, folic acid, micronucleus

Asam Folat Dosis Lazim Menurunkan Frekuensi Mikronukleus Mukosa Bukal pada Perokok

Abstrak

Asap rokok mengandung senyawa kimia toksik yang memicu ketidakstabilan DNA. Deteksi genotoksik awal rongga mulut ditandai dengan kemunculan mikronukleus (MN) pada mukosa bukal. Folat diperlukan dalam menjaga kestabilan DNA. Penelitian ini bertujuan mengetahui efek asam folat dosis lazim (400 mcg dan 1.000 mcg) terhadap frekuensi MN mukosa bukal pada perokok aktif. Penelitian ini merupakan uji klinis yang dilakukan pada bulan November 2018 di Laboratorium Fakultas Kedokteran, Universitas Islam Bandung terhadap 53 perokok aktif yang dibagi ke dalam dua kelompok perlakuan. Kelompok A mendapatkan suplementasi asam folat 400 mcg dan kelompok B mendapatkan suplementasi asam folat 1.000 mcg selama tiga pekan. Apus mukosa bukal diwarnai dengan *hematoxylin-eosin* (HE) dan diamati melalui mikroskop cahaya dengan pembesaran 100× dan 400x. Data dianalisis dengan uji Wilcoxon secara statistik. Hasil penelitian menunjukkan bahwa terdapat penurunan frekuensi MN yang signifikan (p=0.00) terhadap suplementasi asam folat selama tiga minggu, yaitu kelompok A=3,80±2,66 dan kelompok B=3,31±2,71 pada pre-suplementasi, serta kelompok A=6,39±3,92 dan kelompok B=6,93±5,82 pascasuplementasi asam folat. Pemberian dosis 400 mcg dan 1.000 mcg selama tiga minggu tidak memberikan hasil yang bermakna (p=0,94) berdasar atas Uji Kruskal-Wallis. Simpulan, pemberian asam folat dosis lazim memberikan hasil baik terhadap penurunan frekuensi MN mukosa bukal pada perokok aktif.

Kata kunci: Asam folat, mikronukleus, perokok aktif

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Introduction

Smoking is one of the unethical lifestyles associated with genetic damage. Tobacco contains toxic chemical compounds and free radicals which can trigger cell damage and induces mutations in the deoxyribonucleic acid (DNA) which will increase the risk of malignancy in the oral cavity, lungs, and other non-communicable diseases.[1–3]

Indonesia had the first largest number of smokers in the world in 2015; there were 76.2% of smokers who were aged 15 years and older. West Java contributes to the 4–6 times increase in the proportion of active smokers at 1% and passive smokers at 62.8%.[3] A total of 10.9 million residents of the Bandung city became smokers by spending 12–29 cigarettes per day.[4]

The buccal mucosa (BM) is a covered flat epithelial layer that functions as a protection for the oral cavity against potential carcinogenic substances that can produce potential reactive products in the oral cavity. The cells in the BM layer used to detect the occurrence of initial genotoxins caused by carcinogenic inhalant substances such as cigarette smoke. Exfoliated buccal cells used as non-invasive indicators of genotoxic effects characterized by the appearance of MN in cells. The frequency of the micronucleus is proportional to the degree of exposure and the potential of carcinogenic substances.[5] An examination of buccal MN cells can be done using HE staining through observation of a light microscope or specific DNA stainings such as acridine orange and Feulgen. This method can be used regularly as an initial screening in groups of individuals who are susceptible to exposure to carcinogenic substances. The presence of MN is a reliable indicator of chromosome damage due to the loss of the whole and partial chromosomes.[6]

Free radicals in cigarettes cause oxidative stress and can lead to atherosclerosis, diabetes, cancer, neurodegenerative disorders, cardiovascular disorders, and other chronic conditions.[7,8] High free radicals will cause endogenous antioxidants in the body to decline and are not effective against the harmful effects of free radicals. Exogenous antioxidants or other micronutrient supplements are needed to prevent the harmful effects of free radicals for becoming a cofactor for antioxidants to maintain optimal gene health.[9,10] One of the essential micronutrients is folic acid.[8]

Folate need in DNA stability by synthesizing with deoxythymidine monophosphate (dTMP) derived from deoxyuridine monophosphate (dUMP). It plays a role in donating methyl in folate-methionine methylation. Vitamin B12 deficiency also produces high uracil, which causes restrictions on folate synthesis through the inhibition of the synthetic of 5,10 methylenetetrahydrofolate. The result is in DNA mutations, single-stranded DNA formation, DNA fragmentation, chromosomal damage, and MN formation. Folate and vitamin B12 need for the synthesis of methionine through remethylating of homocysteine (HCy) and the S-adenosylmethionine (SAM) synthetic; a typical methyl donor needed for the maintenance of DNA methylation patterns.[6,7] Based on the description above, the researcher was interested to see the effects of folic acid at usual dosage (400 mcg and 1,000 mcg) to the frequency of buccal mucosa MN in active smokers.

Methods

The 60 participants selected regarding the duration of smoking habits; minimum for one year. The participants should have no alcoholic consumption habits, systemic diseases, allergy to folic acid, undergoing radiotherapy, performing oral x-ray examination procedures in the last month, amalgam dental fillings, and chronic infection, and inflammation of the oral cavity. Fifty-three participants follow the entire three weeks of the research period.

The samples swabbed from the buccal mucosa using a buccal brush at pre-supplementation and post-supplementation group of 400 mcg and 1,000 mcg folic acid. The buccal smeared on the glass object and stained by HE. The results were observed on 100 cells and evaluated with 100× and 400× magnification using a light microscope

The data analyzed using the Statistical Package for Social Sciences software (SPSS Inc., Chicago, IL, United States). Data presented as a mean and standard deviation. The differences between the variables were analyzed using the Wilcoxon and Kruskal-Wallis test. A p value of <0.05 was considered significant. This research had approved by the Health Research Ethics Committee of Faculty of Medicine Universitas Islam Bandung with the ethical clearance number: 379/Komite Etik.FK/X/2018.

Results

The MN in the buccal mucosa found in varying amounts between participants. Micronucleus

observations are carried out through a light microscope with 100× and 400× magnification with calculations performed on 100 cells in each buccal mucosa smear. The size of MN is ⅓–⅙ times than the central nucleus, but they have similar round shape and density. The micronucleus images found in this study presented in Figure 1 and 2 below.

The comparison of MN frequency between the participant who were provided 400 mcg and 1,000 mcg folic acid as pre-supplementation and post-supplementation are shown on Table.

In the group of participants who consumed 400 mcg (group A) and 1,000 mcg (group B) the frequency of the post-supplementation micronucleus was lower (group A=3.80±2.66; group B=3.31±2.71) than the pre-supplementation MN (group A=6.39±3.92; group B=6.93±5.82) respectively. There was a significant difference between the frequency of the MN pre-supplementation and post-supplementation of folic acid, both in the group provided with folic acid at 400 mcg and 1,000 mcg. Therefore the implementation of 400 mcg of folic acid was able to significantly reduce the buccal mucosa MN frequency of active smokers, while the dosage
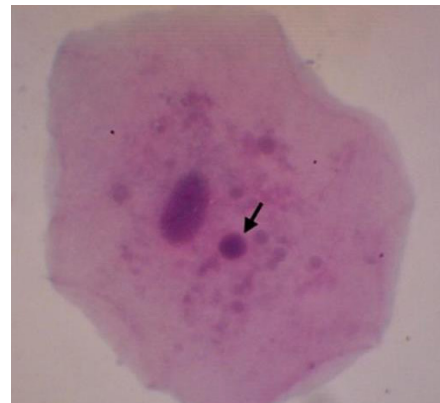
Figure 2 Micronucleus in Buccal Mucosa Cell (arrow head)
Observed through 400× magnification with HE stained

of the 400 mcg and 1,000 mcg did not give any significant effect.

Discussion

Tobacco use habits in various forms are associated with an increased risk of oral cancer.[11] Cigarettes

Table Comparison of MN Frequency between Group

Supplementation	MN Frequency Group A	MN Frequency Group B	p Value
Pre-supplementation	6.39±3.92	6.93±5.82	0.00*
Post-supplementation	3.80±2.66	3.31±2.17	0.00*
Δ	2.59±1.26	3.32±3.65	0.94**

Group A: participants who were provided with 400 mcg folic acids; Group B: participants who were provided with 1000 mcg folic acids; *Wilcoxon test, significance if p<0.05; **Kruskal-Wallis test, significance if p<0.05
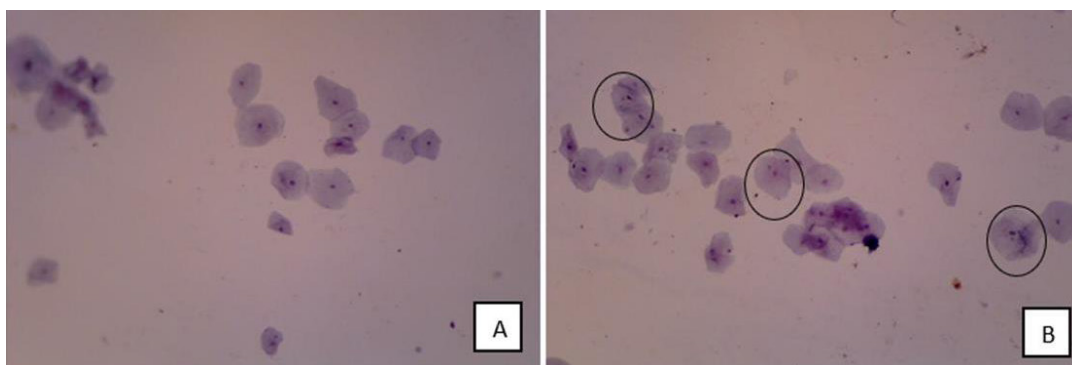
Figure 1 (A) Normal Cell, (B) Micronucleus in Buccal Mucosa
Observed through 100× magnification with HE stained

are complex mixtures of various substances that are genotoxic and carcinogenic to oral epithelial cells.[12] Micronucleus is the result of chromosome changes originating from fragments or whole chromosomes that lag in the anaphase during the break up of chromosomes induced by many genotoxic agents.

Several studies have shown different results regarding the association between cigarette consumption and increasing MN frequencies in buccal mucosa cells.[13,14] In this study, the results of the increase of MN frequency was varied between individuals, with an average value of 6.39±3.92 in group A and 6.93±5.82 in group B. The study by Nersesyan showed that smoking induced MN and other chromosomal anomalies in buccal cells. The cytogenetic effects of cigarettes on exfoliated buccal cells are inconsistent, and these findings suggest that this mismatch may partly be due to variations in tar and nicotine levels of cigarettes smoked by participants.

Folic acid is a part of vitamin B which act as an antioxidant. Several studies have shown that folic acid supplementation can reduce the MN frequency in lymphocytes, buccal mucous epithelial cells significantly in high-risk groups (smokers, alcoholics, patients with chronic diseases). Folic acid provided in high dosage in order to protect cells from the occurrence of DNA damage due to the exposure to high oxidants. Supplementation of 2×1,000 mcg and 3×500 mcg of folic acid was provided for 30 days and was shown to decrease the buccal mucosa MN frequency in previous studies.[16] Our study used folic acid supplementation once daily of 400 mcg, and 1,000 mcg dose indicates the improvement of MN frequency by 50% between the pre-supplementation and post-supplementation of folic acid. Nevertheless, the MN reduction not synchronized with the average MN frequency of healthy people about 0.5–2.5 MN per 1,000 cells according to the research implemented by Jois et al.[17]

Several factors that influence the form of anomalies include smoking habits, local and systemic infections, lifestyle, and the other chronic diseases underlying it. In this study, participants had the same risk factors for the emergence of MN based on data obtained through filling out questionnaires in participants at the beginning of the study. Some participants had an adequate to bad oral health index in the two treatment groups. It could be one of the supporting factors for the high frequency of MN in participants. There is a strong relationship between the plaque index and the calculus with an increase in the frequency of micronucleus in the cell oral epithelium. Dental and calculus plaques are places for oral bacteria that produce chronic bacterial infections.[12] Chronic infections lead to chronic inflammatory processes that are carcinogenic and are associated with the formation of clastogenic genetic damage in oral epithelial cells.[18]

Conclusion

This study concluded that administration of folic acid at a dose of 400 mcg and 1,000 mcg give similar results to a decrease in the buccal mucosa MN frequency in active smokers.

Conflict of Interest

The authors declare no conflict of interests.

Acknowledgments

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RESEARCH ARTICLE

Elastic Band Training Effect to Parameters of Sarcopenia in Elderly Community-Dwelling

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Abstract

Physiologically aging causes the decreased of muscle mass, strength, and or limited activity known as sarcopenia in the elderly. The decrease in muscle capacity occurs in all elderly, active, or sedentary. Exercise for the elderly is considered not enough to prevent the decrease of function that will occur. Therefore, it is necessary to add strength training to the elderly, such as elastic band exercise. The effect of strength training in 12 weeks with elastic band strengthening exercise on muscle mass, muscle strength, and physical performance as sarcopenia parameters measured in this study. The interventional study design was conducted in elderly community-dwelling in Bandung city, West Java, from May to July 2016. Thirty elderly (60–81 years old) muscle mass measured using bioelectrical impedance analysis (BIA), handgrip strength using hand dynamometer and walking distance as the parameter of physical performance, using 6-minute walking test. Significant differences found in hand muscle strength (p=0.007), walking distance (p=0.000) after elastic band strengthening exercise, but there were no significant changes in muscle mass (p=0.236) even though the muscle mass increased after 12 weeks of strengthening exercise. In conclusion, additional elastic band strength exercise for regular elderly exercise can increase muscle strength and physical performance.

Key words: E lastic band, elderly, strengthening exercise

Pengaruh Latihan dengan Pita Elastik terhadap Parameter Sarkopenia pada Usia Lanjut di Komunitas

Abstrak

Penuaan secara fisiologis menyebabkan penurunan massa, kekuatan otot dan/atau keterbatasan aktivitas pada usia lanjut (usila). Penurunan kemampuan otot ini terjadi pada semua usila, baik yang aktif maupun nonaktif sehingga senam usila yang ada dianggap tidak mencukupi untuk mencegah penurunan fungsi yang akan terjadi. Oleh karena itu, diperlukan penambahan latihan kekuatan pada usila seperti latihan kekuatan menggunakan pita elastik. Penelitian ini bertujuan mengetahui pengaruh latihan kekuatan dengan pita elastik selama 12 minggu terhadap massa otot, kekuatan otot, dan performa fisik yang merupakan parameter sarkopenia pada usila. Desain penelitian intervensi dilakukan pada usila di komunitas Kota Bandung, Jawa Barat periode bulan Mei sampai Juli 2016. Sebanyak 30 partisipan (usia 60–81 tahun) diukur massa otot menggunakan *bioelectrical impedance analysis* (BIA) dan kekuatan otot menggunakan dinamometer tangan, serta uji jalan 6 menit untuk mengukur performa fisik. Perbedaan bermakna ditemukan pada kekuatan otot tangan (p=0,007) dan jarak tempuh jalan (p=0,000) setelah dilakukan latihan kekuatan dengan pita elastik, tetapi tidak didapatkan perbedaan bermakna pada massa otot tangan dan kaki (p=0,236) walaupun terjadi peningkatan massa otot setelah dilakukan latihan selama 12 minggu. Simpulan, penambahan latihan kekuatan dengan pita elastik pada program senam usila meningkatkan secara bermakna kekuatan otot dan performa fisik usila.

Kata kunci: Latihan kekuatan, pita elastik, usila

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Introduction

The elderly population is continuing to increase rapidly in the world, including in Indonesia. Older people in Indonesia increased to more than 7% of the population in 2012 along with an increase in live expectancy from 64.5 years old in 2000 (7.18%) to 69.65 years old in 2011 (7.58%).[1]

Studies have shown that the aging process is related to age-related progressive loss syndrome of the muscle mass and the resulting loss of strength and function, known as sarcopenia. This condition combines with the physiological process of elderly that are generally less physically active than younger adults, will reduce quality and expectancy of life in older people.[2,3]

Prevention and treatment of sarcopenia are something that should be done to achieve successful aging, that includes keeping the ability of the elderly to live independently to perform their daily functional tasks.[4] Therefore, it is essential to develop an effective program to support the elderly in increasing their physical activity and habitual physical activity behaviors.[3]

In Indonesia, some exercises developed for the elderly. In general, the component of the exercise consists of flexibility, balance, agility exercise, and less of resistance exercise (strengthening). Based on the previous studies, one of the exercise that recommended to decreased the loss of muscle strength, mass and functional capacity in elderly is resistance exercise.[4]

Many studies showed the resistance exercises increase strength and function in elderly. However, there is a limited study which examines the effects of using an elastic band (EB) as a tool in resistance training.[2,5]

Elastic band resistance training is a low-to-moderate-intensity exercise that is simple to use, portable, economical (inexpensive) and has safety advantages for older people. It provides variable resistance and allows changes in the external load over a range of motions. When an elastic material stretched, the amount of resistance in the material is proportional to deformation its initial length. Using EB will decrease the risk of excessive weight loading that may cause the elderly injured.[2,5]

The purpose of this study was to understand the effect of EB resistance exercise on parameters of sarcopenia (muscle mass, muscle strength, and physical performance) in elderly community-dwelling.

Methods

This interventional study conducted using pre-posttest observation in community-dwelling elderly in Bandung, West Java, from May until July 2016. The inclusion criteria for the subject of this study were age more than 60 years old, able to walk independently without an assistive device, cooperative, and routinely doing exercise. They excluded if their score of mini-mental state examination were less than 17, having a history of unstable cardiorespiratory problems, diabetes mellitus, using an artificial implant, in hormonal therapy and using long term steroid. Subjects will be excluded from the study if they absent in elastic band exercises twice in a row or three times non-consecutively. All participants have to complete resistance exercise using elastic band (ÒThera-Band), three times per week in 12 consecutive weeks. Exercise initiated by choosing the appropriate EB (yellow, green, or red) for each participant (based on 10 RM maximal in doing biceps curl for each color). Exercise in EB consisted of reverse flies, chest press, side shoulder raise, deadlift, upright row, biceps curl, triceps extension, leg press, hip flexion, and knee extension. Evaluation of maximal intensity was done every four weeks until 12 weeks.

Muscle mass measured using portable bioelectrical impedance (BIA, ÒTanita BC 601, Tokyo, Japan). A hand dynamometer (ÒJamar, Lafayette, USA) used to measure the muscle strength while physical performance measured through a 6-minute walking test to measure the walking distance. Characteristics of the subjects that may interfere with the result, such as age, body mass index (BMI), and level of activity (using the Global Physical Activity Questionnaire score) recorded.

Chi-square test was used to analyze the characteristics of the subjects. The Shapiro-Wilk test determines the data normality test. The difference between pre and post-exercise analyzed using t test if the data distribution is normal and Wilcoxon match pair if data were not in the normal distribution.

The protocol of this study approved by the Health Research Ethics Committee, Faculty of Medicine, Universitas Padjadjaran Bandung with letter number: 115/UN6.C1.3.2/KEPK/PN/2016.

Results

In this study, the writer able to collect exercise data from 25 elderly females and five male. Seven subjects dropped out because they could not complete the required resistance exercises. Characteristics of the subjects are in Table 1.

Most of the subjects of this study have an overweight body mass index and more significant muscle strength and mass on right hand and leg. Most of the subjects (60%) have GPAQ score in high activity level classification, and other (40%) have moderate level physical activity. In this study, we did not differentiate dominant or non-dominant hand; it meant both right and left leg mass and strength recorded as a single variable that analyzed in the next step.

Table 2 shows the increasing average of muscle mass after the exercise both in arm and leg, meanwhile the Table 3 shows the significant increasing average after exercise only happened on muscle strength and walking distance, but not in muscle mass.

Discussion

Aging changes all body part, including the musculoskeletal system. This changing in skeletal muscle is characterized by loss of muscle mass and reduce muscle function due to loss of motor units, changes in muscle fiber type, muscle fiber atrophy, and reduced neuromuscular activation. These process caused adverse effects, such as delayed reaction time, decreasing of strength, movement velocity, and muscle forces identified as primary factors of disability (decrease of functional capability) and loss of independence in older people.[6]

The changes also accompanied by alteration of muscle metabolism, including insulin sensitivity and mitochondrial capacity. It also diminished regenerative capacity and satellite cell potential, neuromuscular junction (NMJ) dysfunction and vascular changes that likely further compromise the muscle function.[7] All of these changes may further reinforcing sedentary habits that made the vicious cycle, which in turn promote further weakness and loss of power causing further functional disability.[8]

The findings of the study above showed that physical inactivity is a secondary factor affecting muscle aging. Exercise or physical activity is well-established countermeasures against that condition as a secondary aging (aging that involving interactions of primary aging with environmental influences and disease).[9]

Resistance training, as one type of physical exercise, is probably the most effective therapy and will provoke beneficial adaptation to the muscle.[2,10] Resistance exercise acutely increases muscle protein synthesis, prevent age-associated intermuscular adipose tissue infiltration, improve the neural and vascular function of older subjects. It also promotes specific type II muscle fiber hypertrophy and also improves strength and physical performance by blocking muscle degradation pathways via follistatin rather than inducing muscle growth through the IGF-1 pathway.[11,12] Muscle accretion from resistance exercise may be regulated by an increase in the activation of the mTOR muscle protein synthetic pathway, satellite cell activation and proliferation, anabolic hormone production and a decrease in catabolic cytokine activity.[13]

Evidence suggested that resistance training with EB increases functional performance and improves muscle mass in older people. This kind of exercise, effective in reversing age-related changes and enhancing the quality of life among older people.[14] Elastic band resistance training can help elderly gain strength in a similar way to that of using free weights or a weight training machine. Resistance exercise using EB can be used to perform an extensive range motion and initiate eccentric and concentric muscle contractions and also allows users to exercise by adjusting grip width or rubber stiffness to achieve a greater or lesser intensity.[14]

By doing EB resistance exercise, elderly partially against sarcopenia that has the inflammatory process as one of the underlying cause by lowering the level of TGF-Ò and improving the immune system.[15] The other mechanisms proposed is the result of the study that showed the positive impact of the exercise to mitochondria, an organelle that thought to be impaired along in increasing of age. Exercise training, including endurance and resistance exercise, stimulates mitochondria biogenesis through increases in the peroxisome proliferator-activated receptor coactivator 1a (PGC-1a).[16] Recent studies also suggested that exercise can improve function/efficiency of mitochondria through the remodeling of the mitochondrial

Table 1 Characteristics of Subjects

Variables	Mean (SD)	Median	Range (Min–Max)
Age (years)	69.73 (5.95)	69.50	60.00–81.00*
Height (cm)	15340 (7.11)	152.00	141.00–165.00*
Weight (kg)	58.80 (5.92)	59.50	44.00–75.00*
BMI (kg/m²)	25.27 (2.68)	25.40	19.50–29.20
Right hand muscle strength (kg)	17.96 (5.05)	18.17	8.00–30.00*
Left hand muscle strength (kg)	16.31 (3.91)	16.67	9.33–26.67*
Right hand muscle mass (kg/m²)	1.68 (0.28)	1.60	1.30–2.50
Left hand muscle mass (kg/m²)	1.56 (0.25)	1.50	1.30–2.30
Right leg muscle mass (kg/m²)	6.72 (0.98)	6.60	5.60–9.70
Left leg muscle mass (kg/m²)	6.62 (0.93)	6.45	5.50–9.10
Walking distance (m)	365.63 (31.83)	375.00	315.00–435.00

BMI: body mass index; *Normal data distribution

Table 2 Muscle Strength and Mass Before and After Elastic Band Exercise

Variables	Mean (SD)	Median	Range (Min–Max)
Muscle strength (kg)			
Before exercise	34.25 (8.48)	35.50	18.33–56.67
After exercise	36.99 (10.03)	36.83	19.67–60.67
Muscle mass (kg/m²)			
Before exercise	16.59 (2.38)	16.15	13.80–23.10
After exercise	16.93 (2.54)	16.35	14.40–24.60

Table 3 Comparison of Muscle Strength, Muscle Mass and Walking Distance Before and After Elastic Band Exercise

Variables	Before Exercise	After Exercise	p Value
Muscle strength (kg)	34.25	36.99	0.0066*
Muscle mass (kg/m²)	16.15	16.35	0.2400
Walking distance (m)	365.60	402.50	0.0000*

*Significance if $p < 0.05$

network (fusion, fission, and autophagy).[17] Exercise also will induce NMJ hypertrophy that aging process limits the capacity of NMJ to adapt to endurance training.[3,7] Physical activity also has been shown to affect the regenerative capacity of older muscles positively. Both resistance and endurance exercise training ranging from few weeks to months have shown to increase the number of satellite cells, that critical for regeneration, in old animals and subjects.[18]

The results of this study support previous works that showed that 16 weeks of Tai-Chi and resistance training using Thera-band improved muscle strength of upper and lower extremities, lower body flexibility, aerobic endurance, and agility/dynamic balance.[19] The previous study

also showed that elastic resistance therapy for 12 weeks exerted a significant beneficial effect on muscle mass, muscle quality, and physical function in older women with sarcopenic obesity. Other study showed that with only six weeks of stretching or resistive training, it could improve the functional status of older people.[20]

However, this study did not make any significant difference in muscle mass after doing EB exercise, even though there is an increase in muscle mass. That difference results of this study compared to previous works may be influenced by the characteristics of subjects. Gender, age, body mass, physical activity, history of nutrition of the participant and also exercise prescription protocol, including the volume of training that has been given to the subject, may influence the result.

These study participants mostly are more than 65-year-old; it may cause the effectiveness of exercise prescription should be evaluated. The study showed that the muscle power of the elderly with age over 60 decrease rapidly at a rate of 3% to 5% annually. This rapid decreasing of power is affecting the ability to move and react quickly. Therefore, effective strengthening practices must be employed and adjusted to maintain the highest level of function and achieve optimal aging for different age.[8]

This study showed that women have biological superior but suffer higher levels of morbidity compare to men. Beyond 65 years old, the rate of aging showed a rapidly increasing. The women have relatively lower functional capabilities, but a slower rate of aging compare to men. Besides gender, age also influenced the curvilinear relationship of body mass index with body fat percentage (%BF). The study found out that elderly subjects reduce BMI and increase BF% at the same time. The mean difference in BF% between males and females also increased with age, where females gained more fat than males when they became old.[21]

The difference result of this study to previous works could be from the sample of the study, where the number of females is more than males. Also, the subject of this study mostly overweight. This condition should be noted since sarcopenia and obesity are co-morbid illnesses which can cause functional and metabolic impairments in the elderly. Older patients with sarcopenic obesity had two-timed higher risk of developing daily living disability than those without sarcopenic

obesity.[22]

Lower mitochondrial capacity and efficiency is associated with reduced physical performance in the elderly.[23] The elderly with high function have been shown to maintain muscle mass and mitochondrial capacity, whereas low-functioning elderly individuals show decreased muscle mass and mitochondrial function compared to young individuals.[24] The study supports the finding of the previous works that showed EB exercise that only makes a significant increase in muscle strength and physical performance. Most of the subjects in this study have a high classification of physical activity when entering the study. As in one study said that muscle mass did not show a significant association with physical performance in weak elderly, but the significant and high association showed between muscle strength and physical performance in weak elderly.[25] A study that only done in Bandung area, generalized exercise, and the majority of high-level physical activity in the subject, cause the results of this study are limited to be generalized. Another study should be done with the various elderly population, with customized intensity in long term study to make a more appropriate exercise that meets the need of general elderly in Indonesia population. To make prevention of sarcopenia risk development, the body fat beside BMI should become one of further study variable considering its role in inflammation and physical performance of the elderly. Body mass index often criticized for not distinguishing solid fat form lean mass and ignoring fat distribution, which may limit its ability to reveal actual health effects. Other factors such as lifestyle factors in example nutritional status (including decline in appetite and food in aging, less physical activity and psychosocial factors), should also be studied in the relation of the effectiveness of the exercise.[6]

To make an appropriate and effective regimen of EB exercise, nutrition, including the intervention, should be considered. There is evidence suggesting that nutrition intervention (essential amino acids, milk-based proteins, creatine monohydrate, essential fatty acids, and vitamin D), when consumed in conjunction with resistance exercise, may further augment the increase in muscle mass and strength.[13] This nutrition has anti-inflammatory or anti-catabolic properties, which could accelerate muscle recovery following exercise. The co-ingestion of creatine and whey protein during resistance

exercise may augment muscle hypertrophy, with even more significant gains observed when conjugated linoleic acid (CLA) included.[13]

The volume of training and age of participation are an essential determinant of exercise effectiveness, suggesting that higher dosages result in greater adaptive-response, and those aging individuals should consider starting a regimen of resistance exercise as early as possible, to optimize the results.[12]

Result of EB resistance exercise in this study supports the use of this exercise in community health promotion or care centers as an addition to the frequent elderly exercise for improving muscle strength and functional performance and to prevent sarcopenia.

Conclusion

Elastic band strengthening exercise can increase muscle strength and physical performance but do not significantly increase the muscle mass in the elderly.

Conflict of Interest

There is no conflict of interest in this study.

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RESEARCH ARTICLE

The Elderly Expectations of the Caregiver's Sociodemographic Preferences: a Qualitative Approach

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Abstract

Prevalence of chronic diseases and disability will increase at the advancing age. In the future, the need for the caregiver will increase. Only few studies about the expectations of the elderly towards the sociodemographics status of the caregiver found. Unfulfilled expectations of the elderly towards their caregivers may cause both health and non-health issues. The purpose of this study was to explore the elderly expectations of the caregiver's sociodemographic preferences. A qualitative study was carried out to 7 elderly aged 64–77 years old from July to August 2018 in Bandung city. These elderly selected from 7 integrated care posts (*pos pembinaan terpadu/ posbindu*) that met the inclusion criteria: aged 60 years old and above; male or female; capable of communicating adeptly, and no dementia by undergoing the mini-mental state examination (MMSE). A one-on-one interview was conducted at the residence of the elderly using an interview guide consisted of several opened questions related to the caregiver's sociodemographic preferences. A content analysis was carried out. This study discovered that the elderly preferred their family members or relatives whom they can trust to become their caregivers (their children and grandchildren). Most of these elderly also preferred daughters who live with them and has a decent income. If the family members could not become their caregiver then their neighbor or a community volunteer/cadre, they knew well, and trust to be their caregiver. It concluded that the elderly prefer their daughters who live with them and has a decent income to be their caregivers.

Key words: Caregiver, elderly, family member, sociodemographic

Ekspektasi Usia Lanjut terhadap Status Sosiodemografi *Caregiver*: Suatu Pendekatan Kualitatif

Abstrak

Prevalensi penyakit kronis dan disablilitas akan meningkat dengan pertambahan usia. Hal ini berdampak pada kebutuhan terhadap *caregiver* akan meningkat pula. Penelitian tentang ekspektasi usia lanjut terhadap status sosiodemografi *caregiver* belum banyak dilakukan. Ekspektasi usia lanjut merupakan faktor penting karena bila ekspektasi tersebut tidak terpenuhi maka akan berisiko timbul masalah kesehatan dan nonkesehatan. Tujuan penelitian ini mengeksplorasi ekspektasi usia lanjut terhadap status sosiodemografi *caregiver*. Studi kualitatif dilakukan terhadap 7 orang usia lanjut berusia 64–77 tahun pada Juli hingga Agustus 2018 di Kota Bandung. Para usia lanjut berasal dari 7 pos pembinaan terpadu (posbindu) yang memenuhi kriteria inklusi, yaitu usia ≥60 tahun, laki-laki atau perempuan, dapat berkomunikasi dengan baik, dan tidak demensia dengan dilakukan *mini-mental state examination* (MMSE). Wawancara dilakukan di kediaman informan masing-masing menggunakan panduan wawancara terkait pertanyaan dengan preferensi sosiodemografi *caregiver*. Analisis konten dilakukan. Studi ini menemukan bahwa usia lanjut lebih memilih anggota keluarga mereka yang dapat dipercaya untuk menjadi *caregiver* terutama anak dan cucu. Anak perempuan yang tinggal bersama usia lanjut dan memiliki penghasilan layak menjadi pilihan utama. Jika anggota keluarga tidak dapat menjadi *caregiver* maka tetangga atau kader yang mereka kenal baik dan dipercaya menjadi pilihan. Simpulan, pilihan utama *caregiver* bagi usia lanjut, yaitu anak perempuan mereka yang tinggal bersama dan memiliki penghasilan layak.

Kata kunci: Anggota keluarga, *caregiver*, sosiodemografi, usia lanjut

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Introduction

The success of health programs in Indonesia has rendered a positive impact towards the increase of life expectancy at birth from 69.81 in 2011 to 71.06 in 2017.[1] This particular success does not necessarily obliterate the increase of the elderly's health status. Degenerative diseases and disabilities are still increasing. According to the Basic Health Research (*Riset Kesehatan Dasar/ Riskesdas*) 2018, in Indonesia, the dependency level of the elderly aged 60 years old and above was 25.75% and escalated according to the increasing age. Those elderly aged 80 years old and above had 2.5 times level of dependence compared to those aged 60–69 years (49.96% and 19.7% respectively).[2] This situation also occur in West Java. According to the same report, the dependency level of the elderly aged 60 years old and above was 27.58%, slightly higher compared to Indonesia.[2]

Disabilities create a dependent state so that the need of caregivers increases. Caregivers can be categorized as formal and informal.[3] Formal caregivers are professional and paid for, while informal caregivers are usually family members, friends, or a member of the surrounding society who volunteers to spare some time and care for the elderly.[3] The category and demography of caregivers vary, although most are in the informal caregiver category and are working, adult females who are part of the family member living with the elderly.[4–6]

Studies concerning the elderly's caregivers in the elderly's caregivers perspectives had been carried out in many countries.[3–9] Hence the expectations of the elderly towards their caregivers is essential to explore.[10,11] Unfulfilled expectations of the elderly towards their caregivers may cause both health and non-health issues.[10] The purpose of this study was to explore the elderly expectations of the caregiver's sociodemographic preferences.

Methods

A qualitative study based on one-on-one interviews was carried out to 7 informants aged 64–77 years old from Bandung city. It is one of the cities in West Java with the most significant number of elderly. A qualitative approach was chosen to explore new information and better comprehension regarding the expectations of the elderly towards their caregivers. This study was carried out from July to August 2018.

The informants came from 7 different integrated care posts (*pos pembinaan terpadu/ posbindu*) selected through simple random sampling was taken from 10% (7 public health center/*pusat kesehatan masyarakat* [*puskesmas*]) of all 72 *puskesmas*. From each *posbindu*, one informant was chosen that met the inclusion criteria as follows: 1) aged 60 years old and above, male or female, 2) capable of communicating adeptly (not experiencing any physical or mental disabilities that can interfere with communication skills), and 3) no sign of dementia by undergoing the mini-mental state examination (MMSE) test. They need to achieve a total score of >23 for the elderly with an educational degree lower than high school and >25 for the elderly with a high school or higher degree of education.[12]

This study had obtained ethical clearance from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Padjadjaran with letter number: 727/UN6.KEP/EC/2018. The researcher follows the protocol on data collection procedures by explained the purpose and procedures of the study beforehand. If the informants agreed to be an informant of the study, they were asked to sign the informed consent sheet. Data recorded a voice recorder (mp4).

A one-on-one interview is conducted at the informant residence using an interview guide. It consisted of several opened questions related to the caregiver's sociodemographic preferences. The topics explored were the choices for formal or informal caregivers, the caregiver relationship with the elderly, their gender, marital status, occupation, and residence, along with the tasks expected to be done by them.

One of the researchers transcribed the interview results in ad verbatim and then distributed to the two other researchers for validation. The principal researcher led the content analysis of the collected data.

Results

From 7 informants interviewed the aged range from 64–77 years old. Informants with and without a partner were similar in the ratio and mostly had lower education and unemployed. Only one informant had a business at home. All informants had children who all already married,

except for one informant without a child (Table 1).

This study discovered that all informants reside in their own homes and mostly live with several family members, including children. The children of the informants who were no longer living with the informants mostly still lived in the same region or in the same city (Table 2).

The children living in the informants' houses were mostly married male. One informant lived with her daughter and one live the son and daughter.

This study discovered that all informants had a caregiver, despite able to carry out their daily

Table 1 Informant Characteristics

Code	Sex	Age	Marital Status	Previous Education	Occupation	Number of Children	Children's Marital Status
I1	F	68	Married (no spouse)	Elementary school	Unemployed	2	Married
I2	F	68	Married	High school	Unemployed	3	Married
I3	F	68	Married	Junior high school	Unemployed	–	–
I4	F	64	Married	Elementary school	Unemployed	5	Married
I5	M	75	Married	Elementary school	Unemployed	5	Married
I6	F	72	Married (no spouse)	High school	Employed	4	Married
I7	F	77	Married (no spouse)	Elementary school	Unemployed	4	Married

I: informant, M: male, F: female

Table 2 House Ownership, Living Arrangements, Number of Children, and Residence

Code	House Ownership	Living with	Number of Children	Childrens' Residence
I1	Self-owned	1. Daughter 2. Grandchild 3. In-law	2	Same house
I2	Self-owned	1. Partner	3	Beyond region
I3	Self-owned	1. Partner 2. Younger sibling	–	–
I4	Self-owned	1. Partner 2. Son & daughter 3. Grandchild 4. In-laws	5	Same house
I5	Self-owned	1. Partner	5	Beyond region
I6	Self-owned	1. Son 2. In-law 3. Grandchild	4	Same region and beyond region
I7	Self-owned	1. Son 2. In-law 3. Grandchild 4. Younger sibling	4	Same house and beyond region

I: informant

Table 3 The Elderly' Expectations towards the Caregivers with a Familial Relationship

Informants	1st Choice	2nd Choice	3rd Choice
I1	Children	Grandchild	Younger sibling
I2	Children	Husband	Grandchild
I3	Younger sibling	Husband	Nephew
I4	Children	Grandchild	Grandchild
I5	Children	Grandchild	Wife
I6	Children	Children	Children
I7	Children	Younger sibling	–

Table 4 Sosiodemographic Distribution of the Caregivers Preferences

Code	Sex	Age	Marital Status	Occupation	Residency
I1	Female	Adult	No preference	Unemployed	Nearby
I2	Female/Male	Adult	No preference	Employed	Nearby
I3	Female/Male	Adult	No preference	No preference	Nearby
I4	Female/Male	Adult	No preference	Employed	Nearby
I5	Female/Male	Adult	No preference	Employed	Nearby
I6	Female	Adult	No preference	No preference	Nearby
I7	Male	Adult	No preference	Employed	Nearby

I: informant

activities on their own. Assistance required for several activities such as cooking, doing laundry, or accompanying them to go to the doctor or *puskesmas* when they were ill.

Caregivers of the informants still had a familial relationship, such as partners, children, or younger siblings. The topic of who would be the best caregiver in the case when the informants were incapable of carrying out their daily activities, mostly chose their children as their first choice. The results applied both for informants who still had a partner and those who did not.

The reason stated by the informants regarding their choices was the fact that their children were more capable of taking care of their parents. Most informants assumed that it was now the time for the children to take care of them to return lifelong favor.

"We took care of them since they were a baby. So this is the least they can do for us. Why not my husband to be my caregiver? Because the

children are younger, their stamina is also different. Also, the children should be responsible (of their parents), that is what I think." (I2, female, 68 years old, married)

Another reason for the choice for children as caregivers was that children were considered giving their love and care unconditionally. They are emotionally closer to their parents compared to the in-laws or other family members, as stated in the following.

"Love and affection given by children to their parents are different compared to others. Our children know that they have been taken care of since they were a baby until they now have their own. So it makes them closer to us, that is what I feel regarding children, especially my own." (I7, female, 77 years old, widowed)

This study showed that there was one informant without a child, who chose a younger sibling who lived close by as a caregiver. The reason stated to

comprise a very close relationship and a high level of trust between the two. This informant did not choose her husband to be her caregiver because her husband was still had several activities and was often not at home.

Regarding the second choice who would be their caregivers, this study discovered that caregivers who had a familial relationship still be the choice, especially grandchildren. For informants without a spouse, the second choice varied, from a younger sibling to children and grandchildren (Table 2). The third choice, meanwhile, mainly comprises of grandchildren, nephew, and spouse for informants with a partner, and grandchild or children for informants that did not have a spouse.

This study discovered that most of the informants did not wish for a non-family member to become their caregiver. Two informants stated that if the family member could not become their caregiver, then they prefer their neighbor or a community volunteer (cadre) they knew well to be their caregiver.

The reason stated for those who had no preferences was that it did not matter to them as long as their caregivers can spare enough time to take care of them, was wholehearted in caring for them and attentive. Informants who chose females as their caregivers had reasons that their daughters were their eldest children, that they felt close to their daughters and did not feel awkward if taken care of by them. While informants who chose males as their caregivers considered them more financially secure and were also their eldest children.

Regarding marital status, all informants had no preferences of their caregivers' marital status. Part of the informants stated that it only matters that their caregivers were capable of taking care of them, as stated in the following.

"Those who are married and not are the same, as long as they can take care of me, for example, nowadays, when I need to go to the hospital, I go with my child or grandchild." (I5, 75 years old, married)

In this study, the expectation of the informants towards the occupational status of their caregivers varied. Most of the informants were supportive towards caregivers who were employed, assuming that by having a job, the caregivers could fulfill the needs of their family

and their own. One informant preferred the caregiver to be unemployed, assuming that females had a responsibility as a housewife. All informants preferred their caregivers to live close.

The expected tasks for their respective caregivers were to assist the informants in their daily activities, such as eating, drinking, dressing up, going to the bathroom, bathing, and also transporting. When the informants were ill, the caregivers were expected to take care of them by feeding, bathing, assisting them into the bathroom, and dressing. The informants also expected that the caregivers could take them to go to the *posbindu*, a doctor, the *puskesmas* or the hospital. These caregivers were also expected to be able to do housework and accompanied the informants to the mosque, markets, and recreational sites.

"Yes, just ordinary work, most washing dishes, wiping, cleaning the garden, accompanying me to the health center or hospital, if dizzy at home, take the city bus to the city square. Returning from the city square, come back here again, it's refreshing." (I2, female, 68 years old, married)

"Washing, cleaning, cooking. If I am ill: showering, changing clothes, going to the bathroom, also feeding. If I want to go, they accompany me to the mosque market." (I3, female, 68 years old, married)

Regarding the informants' desires to live in a nursing home showed that some of the informants did not even know about nursing homes. The informants who did stated their reluctance to live in a nursing home because they trusted their children more than other people and that living in a nursing home was something their children forbade them to do. Another opinion stated by an informant was that there was a particular fear of not being cared for in the nursing home because most of those homes were free of charge and also a feeling of distrust towards caregivers working in the nursing home whom they were not familiar. The informants stated that children who put their parents in a nursing home were ungodly (*durhaka*) children. Children who did not want to take care of their parents will put them in a nursing home.

"I do not know, but If my children put me in the nursing home, they are ungodly children." (I2,

female, 68 years old, married)

Discussion

Indonesia is currently a country with a higher proportion of the elderly compared to children under five. According to the Statistics Indonesia, in 2030, the proportion of the elderly will double in comparison to children under five (13.8%, 7.4%, respectively).[13] This increase will be a risk factor for socioeconomic and health status. The condition of the health of the elderly in Indonesia is not excellent. The number of illnesses in the elderly in 2017 is 26.72% on average (20.49–36.02%).[13] From that number, 35.31% is suffering from chronic diseases and requires hospitalization for more than a week.[13] With that condition, the need for caregivers will arise and become an essential issue for the near future.

Caregivers are people who care for other people, including the elderly, whether they are being paid or not. They are usually family or friends of the elderly.[7,8] This study showed that a majority of the elderly preferred informal caregivers to formal ones, especially those who were relatives as a first, second, and even a third choice compared to having a stranger to care for them. These informal caregivers were their children or grandchildren. These findings are in coherence to a prior study conducted by Liu in Taiwan, where 75% of the elderly accompanied by informal caregivers who were also family members.[14] Other studies conducted by Ahmad in Pakistan[9] and Watta et al.[11] in southern Sri Lanka showed the same result. The people in Asian countries believe that family is a matter of utmost importance. According to Lamb,[15] the family is a priority to the elderly and acts as some old age guarantee/insurance for them. A study by Loureiro et al.[5] in Brazil found that family is perceived as a reciprocal unit towards the care of a parent or a senior citizen that given in the past and as hope that this family will have the same experiences as they will get old.

The first choice of informal caregivers were children. The main reason for this majority of choice was that the elderly considered that it was the time for their children to care for their parents as a form of returning lifelong favor. The children feel obligated to become caregivers due to their affection and respect towards their parents. Aside from those feelings, they also feel a particular moral obligation to return the favor to their parents who have sacrificed and raise them with affection.[11,15] The care that is given by children to their parents based on moral obligation, religion, society expectations, and children's affection for their parents. In Indonesia, parents still consider being on a high cultural value. Children obligated to care for their parents as much as their parents have cared for them in the past.[16]

Female children are the top choice to become caregivers. In the gender context, females are positioned to care for their families, starting from when they were children, as partners, and as parents. With this 'care' experience, a female requires minimum adaptation in caring for their parents compared to males.[17] Even so, the gender choice in caring for parents also depend on the emotional proximity[18] between a parent and their child, financial stability, and cultural values upheld by the family.[19] A study by Schröder-Butterfill and Fithry[20] discovered that in the Minangkabau culture that upheld matrilineality, parents preferred daughters to become their caregivers, while in the Javanese culture, choice of gender was not an important issue.

In this study, all the caregivers were married with children and lived with their parents. This condition is called the sandwich generation.[21] The sandwich generation faces a variety of situations, including time, energy, job, and resource management, to care for their parents, along with their children.[21] A study of eighteen working women by Evans et al.[22] revealed that role balance strategies should be developed among these working 'sandwich' generation women. Evans et al.[22] discovered that to be a working woman and at the same time to care for her family (parents and children) must be seen positively. Six within-role balance strategies discovered in this study were living with integrity, being the best you can, doing what you love, loving what you do, remembering why and searching for signs of success. This study also described six between-role balance strategies: maintaining health and wellbeing, repressing perfectionism, managing time and energy, releasing responsibility, nurturing social connection and reciprocating.[22]

Migrant children increase rapidly. A study in Thailand revealed that some assistance could be carried out by using the technology provided. Distant children could use the bank to transfer money to their parents. Nowadays, technology also eases communication between parents and children. The cell-phone is easy and relatively

cheap to provide.[23]

If the elderly need to go to the doctor or if they are disabled and the family members or relatives were incapable of becoming a caregiver, then these caregivers will be from other informal caregivers or paid formal caregivers.[24] Examples of informal caregivers are neighbors and friends.[24] This study showed that if there were no family members to become the caregiver, then an acquaintance, a neighbor, or a familiar community volunteers (cadre) was chosen to become one. A study by Faquinello and Marcon[24] found that most informal caregivers who were not relatives were neighbors and friends who were considered closer to the elderly long before they were rendered dependent. They consent to become a caregiver due to moral consciousness as a friend, even though this opinion is still a controversy.

Formal caregivers, such as those in nursing homes, did not make it into consideration. This study discovered that nursing homes were not considered by the elderly because it was perceived as a facility with a lack of human resources, a detached relationship between the occupants and was a disrespectful act to send parents into the nursing homes. The results are in line with a study by Mendez-Luck et al.[25] conducted in Mexico who found that staying at home instead of a nursing home was considered more affectionate due to its emotional warmth and services. Care for parents require affection that could not get in the nursing homes.

This study had its limitations. Almost all informants were females so that the perspective of male elderly was not explored thoroughly. Moreover, there were no elderly from a nursing home, which can enrich the expectations of the elderly towards the formal caregivers who worked in the nursing home. Another limitation was that no direct observation made of the relationship between the elderly and their children during the interview. Although this study had some limitations, this study had a significant result in providing a clear illustration that in the Indonesian culture, informal caregivers who were family members had become the first choice considered by the elderly and if there were incapability of the family members or relatives of becoming a caregiver, the neighbor or a familiar community volunteers (cadre) was chosen to become one. Future studies should be carried out to explore the child's perspective towards the caring of their parents.

Conclusions

The elderly prefers their family members or relatives to become their caregivers, especially their children and or grandchildren. The main reason for this majority of choice as it was the time for them to return lifelong favor. Most of these elderly also prefer daughters who live with them and has a decent income, although the gender choice in caring for parents also depend on the emotional proximity and cultural values. If the family member could not become their caregiver, then they prefer their neighbor or a community volunteer (cadre) they knew well to be their caregiver.

Conflict of Interest

The authors declare that they have no conflict of interest.

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RESEARCH ARTICLE

Risk Factors of Intra-familial Hepatitis B Virus Transmission among Hepatitis B Patients in Kupang, Indonesia

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Abstract

Hepatitis B is caused by acute or chronic hepatitis B virus infection. It is the most dangerous liver disease compared to other liver diseases due to its lack of apparent symptoms. The symptoms include slight jaundice in the eyes and skin accompanied by lethargy. This study aimed to determine the risk factors for intra-familial transmission of hepatitis B virus for household contacts of hepatitis B patients. The analytical correlation study with a cross-sectional design was conducted from June to July 2018 in Alak subdistrict, Kupang, Indonesia. Venous blood was collected from 45 subjects consisting of 12 patients and 33 family member. Examination was then performed using HBsAg test strip, resulting in the percentage of transmission of 15.15%. Statistical analysis revealed p>0.05. In conclusions, no relationship between gender, age, education, marital status, occupation, and HBsAg status. These characteristics are not risk factors for conversion of HBsAg status.

Key words: Hepatitis B, household contact, risk factors

Faktor Risiko Penularan Virus Hepatitis B Kontak Serumah di antara Pasien Hepatitis B di Kupang, Indonesia

Abstrak

Hepatitis B disebabkan oleh infeksi virus hepatitis B yang bersifat akut atau kronik. Penyakit ini termasuk penyakit hati yang paling berbahaya dibanding dengan penyakit hati yang lain karena tidak menunjukkan gejala yang jelas. Gejalanya hanya sedikit warna kuning pada mata dan kulit disertai lesu. Penelitian ini bertujuan mengetahui faktor risiko penularan virus hepatitis B pada kontak serumah pasien hepatitis B. Penelitian korelasi analitik dengan desain *cross-sectional* ini dilaksanakan pada bulan Juni sampai Juli 2018 di Kecamatan Alak, Kupang, Indonesia. Darah vena diambil dari 45 subjek yang terdiri atas 12 pasien dan 33 anggota keluarga. Pemeriksaan kemudian dilakukan menggunakan strip tes HBsAg menghasilkan persentase penularan 15,15%. Analisis statistik didapatkan p>0,05. Simpulan, tidak terdapat hubungan antara jenis kelamin, usia, pendidikan, status pernikahan, pekerjaan, dan status HbsAg. Karakteristik ini bukan faktor risiko untuk konversi status HBsAg.

Kata kunci: Faktor risiko, hepatitis B, kontak serumah

Introduction

Acute jaundice may be caused by hepatitis A, B, C, and E virus. Hepatitis A and E are often the main causes of the jaundice outbreak. Unlike hepatitis B and hepatitis C, hepatitis A does not develop into a severe and chronic disease.[1,2] Infection due to chronic hepatitis B virus is still a global health problem with an estimation that 350 million people in the world are infected with this virus. Indonesia is a country with a high prevalence of hepatitis B.[3,4] Efforts to have national-level data on this disease were made in 2007 with the implementation of a national surveillance, referred to Indonesian Basic Health Research (IBHR), by collecting samples from 21 of 33 provinces in Indonesia. The prevalence of HBsAg, anti-hepatitis core antibody (anti-HBc), and anti-HBs was 9.4% (of 10,391 samples), 32.8% (of 18,867 samples), and 30.6% (of 16,904 samples) respectively.[1,5] The recent IBHR, which was conducted in 2013 in 33 provinces, showed HBsAg, anti-HBc, and anti-HBs prevalence of 7.1% (of 40,791 samples), 31.9% (of 38,312 samples), and 35.6% (of 39,750 samples) respectively.[6] It is worthy to note that there has been a decline in the prevalence of HBsAg (9.4% in 2007 to 7.1% in 2013), indicating that Indonesia has moved from high to moderate HBV endemics.[5]

Hepatitis is an inflammation or infection of the liver cells. The most common cause of hepatitis is a virus that can cause swelling and softening of the liver. Patients often do not realize that they have been infected with the hepatitis B virus and are also unconsciously transmitting to others. Globally, the Western Pacific region has the highest hepatitis B prevalence of 6.2%, followed by the African region (6.1%), Eastern Mediterranean region (3.3%), Southeast Asia region (2.0%), European region (1.6%), and American region (0.7%).[7]

In Indonesia, the number of hepatitis B sufferers in a healthy population is estimated at 4% to 20.3%.[8] According to the International Task Force on Hepatitis B Immunization, Indonesia belongs to the moderate and high endemic hepatitis B group, with a prevalence of 7–10%. At least 3.9% Indonesian pregnant women have hepatitis with a 45% risk of maternal transmission. At present, it is estimated that there are more than 11 million hepatitis B sufferers in Indonesia. In countries with a low prevalence of hepatitis B, most sufferers are aged 20–40 years whereas in countries with a high prevalence of hepatitis B, most of them are children.[9,10]

In 2010, the population of East Nusa Tenggara was 7,015,967 people with the prevalence of hepatitis B being 0.3–1.8. Most hepatitis cases were found in East Sumba and West Sumba districts.[6] Kambuno et al.[11] reported that the prevalence of hepatitis B and hepatitis C was 3.5% and 0.5%, respectively. Data from blood donor screening test in 2017 concluded that there was no relation between characteristics (age, sex, occupation) of blood donors and the prevalence of hepatitis B and C.

Hepatitis B virus can horizontally be transmitted by infected patients through their body fluids such as semen, saliva, blood or blood products, female genital mucous, menstrual blood, and other body fluids. Those at risk are newborns and people who are involved in unsafe sexual intercourse; use contaminated knife and syringe; receive piercing and tattoos; use contaminated toothbrush; and drinking from contaminated glass.[12,13]

New cases of hepatitis B virus (HBV) infection continues to occur in various areas of the world. Transmission from mother to child during pregnancy, which is referred to as vertical transmission or mother transmission to children (MTCT) is one of the biggest causes of chronic hepatitis B infection with maternal viremia as the most important contributing factor.[14–16] In endemic areas, MTCT reaches 25–30% with the lifetime risk of infection up to 60%.[13,17]

Several studies have shown that the presence of infected family members significantly increases the risk of familial transmission.[13,18–20] According to Aini and Susiloningsih[12] family history of hepatitis B with OR 7.633 is statistically significant ($p<0.05$). A person with a family history of hepatitis B has a seven times greater risk that those who do not have a family history of hepatitis B.[12]

This study aimed to determine the risk factors for intra-familial transmission of hepatitis B virus for household contacts of hepatitis B patients.

Methods

This was a cross-sectional analytical correlation study performed from June to July 2018 in the work area of Manutapen Public Health Center

(*pusat kesehatan masyarakat/puskesmas*), Alak subdistrict, Kupang city, East Nusa Tenggara, Indonesia. Puskesmas Manutapen has outpatient clinics and supervises two sub-*puskesmas*. Data in this *puskesmas* showed that 17 patients were found to be HBsAg positive in 2017. The population of this study was all 68 family member from the 17 hepatitis B positive patients, but family members who meet the inclusion criteria were 33 people. From each subject, 3 mL of the venous blood sample was collected and then stored at 4°C for testing.

Reactive HBsAg results were analyzed using correlation coefficient to determine the relationship. Other data were analyzed using chi-square (X-tests^2) and odds ratio (OR).

This study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Nusa Cendana, Kupang with the letter number: 13/UN15.16/KEPK/2018.

Results

This study was conducted on family members of hepatitis B patients using HBsAg test strip to assess the presence or absence of transmission in household contacts. Results showed that 12 patients still presented reactive results, and 5 of 33 (15.15%) family members were found to be HBsAg positive.

Despite the fact that there were more females who were HBsAg reactive (n=11) compared to male (n=6), the difference was insignificant (p=0.731), showing the lack of relationship between gender and HBsAg status. Most of positive subjects were >16 years old with only 1 were <16 years old (p=0.282). No relationship was found between age and HBsAg status. HBsAg status was also found to have no relationship with marital status (p=0.195), occupation (p=0.295), and education (p=0.912) (Table 1).

The frequency of HBsAg positive among Family Members is listed in Table 2. More HBsAg positive cases was found among children of hepatitis B patients. The prevalence of HBsAg-positive cases in husband, wife, and other members was identical.

Discussion

Hepatitis B transmission can occur vertically from hepatitis B positive mother to the child during pregnancy.[20] According to research from Rosalina,[19] infants who fail to form protective immunity can be infected with the hepatitis B virus which may lead to chronic hepatitis and, eventually, hepatocellular carcinoma. They are also likely become a carrier of hepatitis B and

Table 1 Household Contacts of Hepatitis B Patient

Variables	Patients (n=12)	Family Members (n=33)		p Value
		HBsAg Positive	HBsAg Negative	
Gender				
Male	1	5	14	0.731
Female	11	–	14	
Age (years)				
>16	12	3	23	0.282
<16	–	2	5	
Marital status				
Married	11	3	18	0.195
Single	1	2	10	
Occupation				
Working	1	4	13	0.295
Not working	11	1	15	
Level of education				
High	5	2	12	0.912
Low	7	3	14	

Table 2 Frequency of HBSAg Positive among Family Members

Family Members	HBsAg Positive
Husband	1/33
Wife	1/33
Son/Daugther	2/33
Others members	1/33

transmit the disease to others.

In endemic areas including Southeast Asia, hepatitis B transmission from mother to child reaches 25–30% with the lifetime risk of infection up to 60%. Thus, efforts are needed to prevent transmission by taking into account the possibility of immunoprophylaxis failure. Immunoprophylaxis is considered as the most important part of hepatitis B vertical transmission prevention which also prevent other consequences of hepatitis B.[16,21] Perinatal transmission reaches 70–90% in positive HBeAg and HBeAg mothers without immunoprophylaxis. Hence, the comprehensive strategy to eliminate hepatitis B infection includes immunoprophylaxis, which is proven to be able to prevent up to 95% of vertical transmission in infants with hepatitis B mother.[20,22]

A study by Mohammad Alizadeh et al.[17] in Nahavand, Iran concluded that the prevalence of positive HBsAg in Nahavand is 2.3%. Brothers (1–25%) and fathers (1–12.5%) have higher HBsAg marker. The infection rate in husbands and wives of index cases was 10%. Sons and daughters were the most frequent relatives of index cases (32.2% and 23.5%, respectively). In this Iran study, twelve (11%) family members were HBsAg positive, fifty (56.2%) were HBsAb positive, and only one (2.5%) was HBcAb positive.

No relationship was found between sex, age, education, marital status, occupation, and HBsAg status, as evident from the chi-square test results. Shephard et al.[21] also reported that transmission within families is less reported. Intra-familial transmission of HBV is evident in several studies and was possibly associated with the presence of one HBV carrier in the family and the shared use of toothbrushes among household contacts.[23–25]

Hepatitis B is transmitted through percutaneous (i.e., puncture through the skin) or mucosal (i.e., direct contact with mucous membranes) exposure to infected blood or body fluids.[26,27] HBV can cause chronic infection, resulting in liver cirrhosis, liver cancer, liver failure, and death. People with chronic infection also becomes the main reservoir for advanced HBV transmission.[23] Although chronic infection is more likely to develop in infected people during infancy or childhood, the highest rate of new infections and acute illnesses is highest among adults.[15,19]

Based on the research, found the pattern of transmission of hepatitis B virus, namely mothers with HBsAg are directive to children. This transmission can occur through the birth process when micro transfusion occurs or there is contact between the mother's blood and the baby's mucosa during contraction. Meanwhile, transplacental transmission is rare and is estimated to only range from 5% to 15% of all pregnancies with hepatitis B. Hepatitis B e antigen (HBeAg) is the only structure of the hepatitis B virus that can penetrate the placental blood barrier because it has a small molecular weight. Because of the cross-reaction with envelope antigens and core antigens in the recognition of antigens, the transfer of HBeAg through the placenta will cause fetal immunotolerance against Antigens Hepatitis B core (HbcAg). This triggers chronic hepatitis B infection after birth.[15]

It is possible that a HBsAg reactive husband has a non-HbsAg reactive wife but with HBsAg reactive child. This may be due to percutaneous or mucosal exposure to infected blood or body fluids, for example through sharing a toothbrush or razor blade, contact with exudates from dermatological lesions, or contact with contaminated surfaces HBsAg). People with chronic HBV infection can also transmit HBV elsewhere (such as in schools, childcare centers, or facilities for people with developmental disabilities) especially if they behave aggressively or have medical problems (for example, exudative dermatitis or open skin lesions) that increase risk of exposure to blood or serous secretions.[15,17]

However, HBsAg reactive wife can also transmit the disease to the husband or vice versa. A study in the United States has proven that the hepatitis B infection in adults can be transmitted through sexual contacts. In adults who do not receive vaccination, the groups that have a higher risk for getting hepatitis B are people with

multiple sexual partners, injecting drug users, men who have sex with men, and those who are the household contacts and sex partners of people with hepatitis B.[15]

Our study had several limitations in the form of small sample size and limited period of study that affects the number of blood samples obtained. Also, some patients could be contacted. It is suggested that a follow up study is conducted with a bigger sample size.

Conclusions

The percentage of intra-familial hepatitis B transmission in the work area Puskesmas Manutapen, Alak, Kupang city, Indonesia is 15.15%. No relationship was found between gender age, education, marital status, occupation, and HBsAg status. Hence, gender, age, education, marital status, and occupation are not risk factors for hepatitis B.

Conflict of Interest

Authors declare no conflicts of interest.

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