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Mailing Address : Redaksi Media Gizi Indonesia
Departemen Gizi Kesehatan
Fakultas Kesehatan Masyarakat, Universitas Airlangga
Kampus C Unair, Jl.Mulyorejo Surabaya 60115
Telp : (031) 5964808/Fax: (031) 5964809

Media Gizi Indonesia (MGI) has been published since 2004 is a scientific journal that provides articles regarding the results of research and the development of nutrition including community nutrition, clinical nutrition, institutional nutrition, food service management, food technology, current issues on food and nutrition. This journal is published once every 3 months: January, May, and September

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INTRODUCTION TO THE EDITOR

Media Gizi Indonesia (MGI) is a scientific journal published regularly every 4 months that provides articles in nutrition field ranging from community nutrition, clinical nutrition, institutional nutrition, food service management, food technology, and current issues on food and nutrition. MGI also publish special issues from international conference as such presented in this issue. This issue presented studies presented in the 1st International Conference of Health and Nutrition held by Poltekkes Kemenkes Gorontalo, Indonesia. Media Gizi Indonesia tries to always present a variety of scientific articles in the scope of nutrition and health to enhance reader's knowledge and understanding.

This volume provides original research. The theme for original research varies from child nutrition, nutrition education, and food products development. Topic of child nutrition in this issue focus on the relationship between exclusive breastfeeding and psychomotor development. This brings a good impact on advocating exclusive breastfeeding among mothers. Secondly, topic of nutrition education was focusing on diabetes patients and athletes. Not only nutrition education, aspects of physical activity and dietary habits were also discussed. Lastly, majority of this issues were focused on food product development using locally available foods to improve products' sensory and thus, could be used to alleviate nutritional problems in the future.

We do hope MGI scientific journals can leverage the development of a writing culture and communicative scientific studies as well as attract readers and writers to participate in MGI for future issues. Media Gizi Indonesia will maintain its role in providing current, relevant, and topical issues in food and nutrition. Hopefully, the works exhibit by MGI can provide benefits and enrich the readers' knowledge.

Editorial Team

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EXCLUSIVE BREASTFEEDING AND INFANT PSYCHOMOTOR DEVELOPMENT

Rahma Labatjo[1*], Isma Saleh[2], Fitriani R. Blongkod[2]
[1]Jurusan Gizi Poltekkes Kemenkes Gorontalo, Gorontalo
[2]Program Studi Sarjana Gizi Fakultas Sains, Teknologi dan Ilmu Kesehatan, Universitas Bina Mandiri, Gorontalo
[*]E-mail: rahma.labatjo@gmail.com

ABSTRACT

Exclusive breastfeeding is known as giving an infant breastmilk for the first six months. Breastmilk is provided to the infant as the only food source, and they will acquire additional food after 6 months of age. Mothers in Indonesia frequently experience an issue related to exclusive breastfeeding. Some of the mothers' perceptions believe that their breastmilk is insufficient, meaning that the mother merely possesses a limited amount of milk. This study seeks to determine the relationship between exclusive breastfeeding and psychomotor development in infants aged 6-9 months in the working area of Buntuila Community Health Center. This study applied a quantitative approach, while data analysis used statistics. It employs analytical observational research,with cross-sectional design. Samples were collected simultaneously. Based on the study findings, infants who were exclusively breastfed experienced normal development were 17 samples (70.8%), questionable development were 7 samples (29.2%), and deviant development by 0 samples (0.0%). While infants who were not exclusively breastfed experienced normal development were 11 samples (35.5%), questionable development were 13 samples (41.9%), and deviant development were 7 samples (22.6). It is undeniable that exclusive breastfeeding has a significant role in infant's psychomotor development. Therefore, it is important to improve multi-stakeholder actions such as health promotion and campaigns on exclusive breastfeeding.

Keywords*: breastfeeding, infant, psychomotor development*

ABSTRAK

Pemberian ASI eksklusif dikenal dengan pemberian ASI selama enam bulan pertama. ASI diberikan kepada bayi sebagai satu-satunya sumber makanan, dan mereka akan memperoleh makanan tambahan setelah 6 bulan. Ibu di Indonesia sering mengalami masalah terkait pemberian ASI eksklusif. Beberapa ibu percaya bahwa ASI mereka tidak mencukupi, artinya ibu hanya memiliki jumlah ASI yang terbatas. Akibatnya, ibu memutuskan untuk memberikan susu formula pada bayi sebagai pengganti ASI. Penelitian ini bertujuan untuk mengetahui hubungan pemberian ASI eksklusif dengan psikomotorik pada bayi usia 6-9 bulan di wilayah kerja Puskesmas Buntuila. Penelitian ini menggunakan pendekatan kuantitatif karena data disajikan dalam bentuk angka, sedangkan analisis data menggunakan statistik. Penelitian ini merupakan penelitian observasional analitik dengan pendekatan cross sectional study. Berdasarkan hasil penelitian, bayi yang mendapat ASI eksklusif mengalami perkembangan normal sebanyak 17 responden (70,8%), perkembangan yang meragukan sebanyak 7 responden (29,2%), dan perkembangan yang menyimpang sebanyak 0 responden (0,0%). Sedangkan bayi yang tidak diberikan ASI eksklusif mengalami perkembangan normal sebanyak 11 responden (35,5%), perkembangan yang meragukan sebanyak 13 responden (41,9%), dan perkembangan menyimpang sebanyak 7 responden (22,6). Pemberian ASI eksklusif memiliki peran yang signifikan dalam perkembangan psikomotorik anak. Oleh karena itu, penting untuk meningkatkan tindakan multi-stakeholder seperti dalam promosi kesehatan dan kampanye ASI eksklusif.

Kata kunci*: ASI eksklusif, bayi, perkembangan psikomotor*

INTRODUCTION

Mothers in Indonesia frequently experience an issue related to exclusive breastfeeding. Some of the mothers believe that their breastmilk is insufficient, meaning that the mother merely possesses a small amount of milk. This causes mothers to discontinue breastfeeding and switch to formula milk, affecting the infant's future development (Triyani, Meilan and Purbowati, 2019).

Exclusive breastfeeding is known as giving an infant breastmilk for the first six months.

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Breastmilk is provided to the infant as the only food source, and they will acquire additional food when they reach the age of six months (Paramashanti, 2019). Exclusive breastfeeding is not widely practiced in several countries throughout the world. According to UNICEF and WHO data, the coverage of exclusive breastfeeding in India is 42%, in China is 28%, in Thailand is 15%, in Brazil is 13.9%, while in America it only covers 6% (UNICEF, 2018).

Nationally, based on the 2018 Indonesia Health Profile, the coverage of infants who receive exclusive breastfeeding is 67.74%, which has exceeded the 2018 Strategic Plan target of 50%.. Data from the Gorontalo Provincial Health Office in 2018 indicated that only 5,618 infants (46.9%) received exclusive breastfeeding out of the 11,975 infants which spread across Gorontalo City, followed by Bone Bolango Regency (38.2%), Boalemo Regency (41.5%), Pohuwato Regency (46.2%), Gorontalo Utara Regency (50.3%), and Gorontalo Regency (53.8%). This percentage is still below 80% of the target, which has become a common issue in Gorontalo Province (Badan Penelitian dan Pengembangan Kesehatan, 2019).

Data from the Pohuwato District Health Office in 2020 show that the coverage of babies who receive exclusive breastfeeding is 46.2%, with the percentage at the Paguat Health Center 18.0%, at the Marisa Health Center 15.8%, at the Popayato Health Center 15.1%, at the Patilanggio Health Center 13 % and at the Motolohu Health Center it was 11.6% (Pohuwato District Health Office, 2020). Based on data obtained at the Buntulia Health Center in 2020, the coverage of babies who receive exclusive breastfeeding is only 11.7%.

Infants aged 7-9 months who are not breastfed during six months experience delays in motor development as seen from the child's condition, who has not been able to sit stably for a period and has not been able to crawl according to his age. Further, the for mothers who give their infants exclusive breastfeeding for six months possess normal line in development chart, and their development was in line with their age, including: able to move objects, speaking or babbling the word of *"mama"* and *"dada"* and uses various gestures like pointing and shaking his head in response to communication.

The shortage of mothers giving exclusive breastfeeding is caused by the fact that most breastfeeding mothers cannot produce breastmilk and the lack of mothers' insight regarding exclusive breastfeeding. Meanwhile, breastfeeding during the first six months is one of the crucial nutrients for infants.

One strategy to improve baby development is to breastfeed them exclusively. In addition to providing a baby with complete nutritional food, which is a fostered need for infants, breastfeeding boosts a baby's affection, immunity and can help with motor development, personality development, emotional intelligence, spiritual maturity, and healthy interpersonal relationships (Maryunani, 2015)

Exclusive breastfeeding for six months can reduce infant morbidity and mortality, optimize infant growth, boost child's intelligence, and help extend the gap between pregnancies for mothers. Such activities are particularly advantageous in order to protect the infant from various infant mortality diseases (Abani, Paulus and Djogo, 2021).

Wahyuni et al. research in 2019 discovered that there was a relationship between exclusive breastfeeding with normal infant development in 43 babies (87.8%), meanwhile the mothers who did not apply exclusive breastfeeding with normal baby development in 9 babies (25.7%). There is a significant relationship between exclusive breastfeeding and the infant development aged 6-9 months (Sujarwadi *et al.*, 2019). Anggriani's research in 2017, indicated that there is a relationship between exclusive breastfeeding and infants' motor development between the ages of 6 and 12 months. It is identified that the frequency distribution of infant motor development is as many as 30 children (62.5%) with questionable motor development and 3 children (6.2%) with deviant motor development (Anggraini, 2017).

Based on research by Al-Rahmad and Fadillah in 2016, an infant who did not get exclusive breastfeeding had the opportunity to experience psychomotor development below the average standard of two times greater than those who got exclusive breastfeeding. The results revealed that 48.9% of the infant who receives exclusive breastfeeding possess a good motor development

score (9.0) and shows a significant difference compared to motor development in infants who do not get exclusive breastfeeding (Hendra Al-Rahmad *et al.*, 2016). The objective of the study is to determine the relationship between exclusive breastfeeding with infant psychomotor aged 6-9 months in the working area of the Buntulia Health Center.

METHODS

This approach in this research is a quantitative with analytic observational research. Meanwhile, the research design is based on a cross-sectional study. This research was carried out from June to July 2021 at the Buntulia Health Center, Marisa District, Pohuwato Regency.

The research samples are 55 infants aged 6-9 months who were registered and domiciled in the working area of Buntulia Health Center. Sampling technique employed non-probability techniques, i.e., incidental sampling techniques.

In this study, the relationship between exclusive breastfeeding and motor development for infants aged 6 to 9 months was examined using bivariate analysis and the Chi-square test.

RESULTS AND DISCUSSIONS

Data regarding samples' characteristics are presented in table 1.

Table 1. Samples' characteristics

No	Characteristics	Categories	n	%
1	**Mothers' age (years)**	15-25	34	61.82
		26-35	20	36.36
		>35	1	1.82
2	**Mothers' education level**	Elementary school	6	10.91
		Junior school	9	16.36
		Senior school	27	49.09
		Bachelor degree	13	23.64
3	**Mothers' occupation**	Housewife	46	83.64
		Private employee	4	7.27
		Civil servant	9	9.09
4	**Weight (kg)**	3-6	24	43.64
		7-9	31	56.36
5	**Length (cm)**	52-62	41	74.55
		66-76	14	25.45

Based on table 1 of age characteristics indicate that 34 samples (61.82%) were between the ages of 15 and 25, while 20 samples (36.36%) were between the ages of 26 and 35, and there was only one respondent who was in the range of 36-45 years (1.82).

There are 24 infants (43.64%) who weigh 3-6 kg, and there are 31 infants (56.36%) who weigh 7-9 kg and 41 infants (74.55%) who have a body length of 52–65 cm, and there are 14 infants (25.45%) who have a body length of 66–76 cm.

Table 2. Cross Tabulation of Psychomotor Development and Exclusive Breastfeeding

Exclusive Breastfeeding	Psychomotor Development						Total		Pvalue
	Abnormal		Questionable		Normal				
	n	%	n	%	*n*	%	*n*	%	
No	7	22.6	13	41.9	11	35.5	31	100.0	0.003
Yes	0	0.0	7	29.2	17	70.8	24	100.0	
Total	7	22.6	20	71.7	28	106.3	55	100.0	

Exclusive breastfeeding

According to Rahayu et al. (2019), mothers who give birth at healthy reproductive age (20-35 years) are more likely to provide exclusive breastfeeding than mothers who give birth at risky reproductive age (35 years). It is believed that the ability to breastfeed has reduced along with the aging of the organ systems since age over 35, which is an age with a high risk of pregnancy and childbirth (Rahayu *et al.*, 2019).

This research discovered that respondents with an age range of 15-25 years (61.82%) gave their children excessive exclusive breastfeeding since the mother's breastmilk is abundant, so the mother did not need additional formula milk. Meanwhile, a 42-year-old mother, stated that she was starting

to experience hormonal changes, which caused decrease in milk production and decided to gave formula milk to the children. This statement was obtained from the results of the interview with respondents. The result was in line with Ratna's research that stated mothers aged 20-35 years belong to the group of women in childbearing age, where a woman at this age is considered mature and able to reproduce, including in exclusive breastfeeding. Women at that age are regarded as being physically and psychologically prepared for childbirth and capable of caring for their children.

Furthermore, the other factor of earlier discussion is inadequate breastmilk. The low milk production was caused by incorrect nipple attachment, lack of intensity of breastfeeding, medication and contraceptive usage, as well as lack of insight and family support (Arifiati, 2017). This research discovered 24 respondents (housewives) did not provide exclusive breastfeeding to their children due to a lack of sufficient breast milk and preferred the practical approach of using a milk bottle.

Several studies showed that mothers with a poor insight of breastfeeding expertise Perceptions of Insufficient Breast Milk (PKA) (58.6%) compared to mothers with good insight (22.2%). PKA is influenced by three factors, including maternal factors, infant factors, and lactation (Prabasiwi, Fikawati and Syafiq, 2015; Murni, 2019). Further, it was significantly proven that maternal factors (employment status and mother's insight), infant factors (breastfeeding habits and breastfeeding attachment), and lactation factors (early initiation of breastfeeding, hospitalization, and family support) influence PKA.

According to Darsini et.al (2019), insight is a crucial component in the development of someone's actions (Darsini, Fahrurrozi and Cahyono, 2019). A mother's formal education affects the level of the mother's insight, such as low and high formal education. However, the research conducted by the author found that mothers with high education higher levels of education did not exclusively breastfeed their children, in contrast to mothers with low levels of education.

Several factors influence breastfeeding. According to Arifiati (2017), first is the mother's occupation. Working mothers will tend to leave their infants compared to housewives' mothers since they have many opportunities to breastfeed (Arifiati, 2017). In this study, it was found that six of the respondents had stable employment but did not exclusively breastfeed their children. This is due to the fact that these respondents claimed they were too busy at work to have the time to breastfeed their children, so they opted to give formula milk instead. In this case, a total of 31 respondents (56.4%) did not provide exclusive breastfeeding to their children, meaning that exclusive breastfeeding for infants aged 6-9 months is still poor.

The research result is in accordance with previous research by Purvitasari and Purbasari (2019), which concluded that there is a significant relationship between the mother's occupation and the behavior of exclusive breastfeeding, with a value of p-value = 0.041 (Purvitasari and Purbasari, 2019). This demonstrates that, in comparison to housewives mother it is more difficult for working mothers to breastfeed their infants exclusively. Working mothers find it difficult to exclusively breastfeed their infants because of their busy schedules outside the home. Similarly, research conducted by Sihombing (2017) states that there is a relationship between maternal employment and exclusive breastfeeding behavior because the leave period for working mothers will affect exclusive breastfeeding to their babies, and working mothers will give formula milk to their babies (Sihombing, 2018). This is due to the lack of maternal knowledge about breastfeeding. Additionally, there is a relationship between maternal employment and exclusive breastfeeding behaviour because working mothers' leave periods will affect their ability to exclusively breastfeed their infants, and working mothers will prefer to give formula milk. This was due to the lack of maternal insight into breastfeeding.

Infant Psychomotor Development

Based on the study's results, it was found that 28 infants (50.9%) had normal development, while those who have questionable development were accounted for 20 infants (36.4%), and other 7 infants (12.7%) were deviated. Sukesi (2016) claims that one factor that influences infant's development is prenatal factor (during pregnancy), which is related to maternal nutrition

during pregnancy. Mother's nutritional intake and status will greatly affect the fetus' growth in the womb. When the mother's nutritional status is poor before or during pregnancy, it will cause low birth weight babies (LBW), resulting delays in brain development. In addition, Soesilowindradini (2017) stated that one of the factors that influence the development of infant in the postnatal period (the period after pregnancy) is infant nutrition (Soesilowindradini, 2017). Infant growth and development require nutritious food with sufficient portions. If the infants' nutritional intake is lacking, it will hinder the child's growth and development.

In using the child development pre-screening questionnaire (KPSP), when the infant's age is in between, the KPSP used is smaller than the infants' age. Therefore, infants between the ages of 7 and 8 months will use KPSP for infants aged six months. Observations results show that the infants were able to follow the movements of other people by moving his head from one side to the other, was able to hold objects for a few seconds when brought close to the object, was able to maintain an upright and stable head position, was able to lift his chest with his arms in a prone position, able to maintain a stiff neck when his hands are pulled slowly to a sitting position (Napitupulu, 2018).

This was found in 28 children (50.9%) who experienced normal development and were able to perform all the movements listed in the statement based on the KPSP. Meanwhile, 20 infants (36.4%) were questionable in development, the infants could only make 7 movements out of 10 KPSP statements. In addition, in 7 infants (12.7%) who had deviant development could only make 6 movements out of 10 KPSP statements. This is due to slow growth and development while the infants were still in pregnancy. Insufficient mother's intake in fulfilling fetal nutrition affects the infants' development, the reason for this is that the mother experiences nausea and difficulty in consuming food which triggers insufficient intake to fulfill mother's nutrition during pregnancy. This statement was obtained by the author when conducting interviews with the mothers. This study's results align with research conducted by Napitupulu (2018), which states that nutritional status affects infants' motor development. The better the nutritional status, the better the child's development, and vice versa.

Relationship between exclusive breastfeeding and infants' psychomotor

Sutiono (2019) claims that exclusive breastfeeding affects an infant's motor development (Sutiono, 2019). Generally, children who have been breastfed since birth will experience faster development compared to children who receive formula milk. The motor development includes body movement ability, creativity, social skill, and emotional development. Based on the questionnaire results, most of the infants who received exclusive breastfeeding experienced normal development, this was because mothers often visited the Integrated Healthcare Center and monitored their infants' early development and provided motor stimulation to their babies.

Based on Chi-Square test results, it was found that the p-value was $0.003 < 0.05$, which means that there is an associationbetween exclusive breastfeeding and the development of infants in the Working Area of the Buntulia Health Center. With exclusive breastfeeding, development can occur in gross motor skills, fine motor skills, speech and language skills as well as social skills and independence, where these skills show behavior that moves the large muscles of the arms, legs, and torso, for example, lifting the head and sitting.

The results of this study are in line with research conducted by Triyani et.al (2019), which confirms that the duration of exclusive breastfeeding correlates with child development statistically. Toddlers with a long history of exclusive breastfeeding for no more than 4 months experienced deviant development, namely 24%, on the other hand, the majority (47%) of toddlers who received exclusive breastfeeding >4 months (47%) had developments that did not deviate or normal (Triyani, Meilan and Purbowati, 2019). This situation occurs as children given exclusive breastfeeding will grow according to the growth and developmental stage.

CONCLUSION

Exclusive breastfeeding is undeniable has significant roles in children's psychomotor development. Therefore, it is important to improve multi-stakeholders' actions such as in health promotion and exclusive breastfeeding campaign.

REFERENCES

Abani, T.R.K., Paulus, A.Y. and Djogo, H.M.A. (2021) 'Faktor-Faktor yang Berhubugan dengan Perilaku Pemberian ASI Eksklusif pada Bayi Usia 6-24 Bulan di Puskesmas Camplong Kabupaten Kupang', *CHMK Midwifery Scientific Journal*, 4(1), pp. 215–227. Available at: http://cyber-chmk.net/ojs/index.php/bidan/article/view/964 (Accessed: 15 December 2022).

Anggraini, A. (2017) 'Hubungan antara Pemberian ASI Eksklusif dengan Perkembangan Motorik Bayi Usia 6-12 Bulan', *Holistik Jurnal Kesehatan*, 11(4), pp. 196–200. Available at: https://doi.org/10.33024/HJK.V11I4.101.

Arifiati, N. (2017) 'Analisis Faktor yang Mempengaruhi Pemberian ASI Eksklusif pada Bayi di Kelurahan Warnasari Kecamatan Citangkil Kota Cilegon', *Prosiding Seminar Nasional IKAKESMADA 'Peran Tenaga Kesehatan dalam Pelaksanaan SDGs'* [Preprint].

Badan Penelitian dan Pengembangan Kesehatan (2019) *Laporan Nasional RISKESDAS 2018*. Jakarta. Available at: http://labmandat.litbang.depkes.go.id/images/download/laporan/RKD/2018/Laporan_Nasional_RKD2018_FINAL.pdf (Accessed: 28 October 2019).

Darsini, D., Fahrurrozi, F. and Cahyono, E.A. (2019) 'Pengetahuan; Artikel review', *Jurnal Keperawatan*, 12(1), pp. 95–107.

Hendra Al-Rahmad, A. *et al.* (2016) 'Perkembangan Psikomotorik Bayi 6 – 9 Bulan berdasarkan Pemberian ASI Eksklusif', *AcTion: Aceh Nutrition Journal*, 1(2), pp. 99–104. Available at: https://doi.org/10.30867/ACTION.V1I2.18.

Maryunani, A. (2015) *Inisiasi Menyusui Dini ASI Eksklusif dan Manajemen Laktasi*. Edited by A. Maftuhin. Jakarta: CV. Trans Info Media. Available at: http://www.akbidkholisaturrahmibinjai.ac.id/data/1552975028.pdf (Accessed: 15 December 2022).

Murni, T. (2019) *Hubungan Persepsi Ketidakcukupan ASI dan Keyakinan Menyusui dengan Keputusan Pemberian ASI pada Ibu Bekerja di Wilayah Kerja Puskesmas Arjowinangun Kota Malang.* Universitas Brawijaya.

Napitupulu, D.M. (2018) *Hubungan Status Gizi dengan Perkembangan Motorik Kasar Anak Balita 3-5 Tahun di Puskesmas Kelurahan Harjosari 1 Kecamatan Medan Amplas Tahun 2018*. Politeknik Kesehatan Kemenkes Medan. Available at: http://repo.poltekkes-medan.ac.id/xmlui/bitstream/handle/123456789/812/SKRIPSI.pdf?sequence=1&isAllowed=y (Accessed: 15 December 2022).

Paramashanti, B.A. (2019) *Gizi bagi ibu dan anak : untuk mahasiswa kesehatan dan kalangan umum* . Edited by D. Rachmawati. Yogyakarta: Pustaka Baru Press. Available at: https://opac.perpusnas.go.id/DetailOpac.aspx?id=1239743 (Accessed: 15 December 2022).

Prabasiwi, A., Fikawati, S. and Syafiq, A. (2015) 'ASI Eksklusif dan Persepsi Ketidakcukupan ASI', *Jurnal Kesehatan Masyarakat Nasional*, 9(3), pp. 282–287.

Purvitasari, R.K. and Purbasari, A.A.D. (2019) 'Faktor-Faktor yang Berhubungan dengan Pemberian ASI Eksklusif pada Ibu Bayi 6-24 Bulan di RW 05 Pabuaran Mekar Bogor Tahun 2019', *Jurnal Kesehatan Masyarakat*, 7(1), pp. 115–128.

Rahayu, S. *et al.* (2019) 'Hubungan pengetahuan, sikap, perilaku dan karakteristik ibu tentang ASI eksklusif terhadap status gizi bayi', *AcTion: Aceh Nutrition Journal*, 4(1), p. 28. Available at: https://doi.org/10.30867/action.v4i1.149.

Sihombing, S. (2018) 'Hubungan Pekerjaan dan Pendidikan Ibu dengan Pemberian Asi Ekslusif di Wilayah Kerja Puskesmas Hinai Kiri Tahun 2017', *Jurnal Bidan*, 5(1), pp. 40–80. Available at: https://www.neliti.com/publications/234018/ (Accessed: 15 December 2022).

Soesilowindradini, S. (2017) *Psikologi perkembangan (masa remaja)*. Surabaya: Surabaya Usaha Nasional.

Sujarwadi, W. *et al.* (2019) 'Pemberian ASI Eksklusif dengan Perkembangan Bayi Usia 6 – 9 Bulan di Kabupaten Labuhanbatu', *Berita Kedokteran Masyarakat*, 35(6), pp. 211–215. Available at: https://doi.org/10.22146/bkm.43556.

Sutiono, A. (2019) *Hubungan Pemberian ASI EKsklusif dengan Motorik Kasar Bayi 0-2 Tahun di Posyandu Wijayakusuma Dusun Gambyak Keraskulon Kecamatan Gerih Kabupaten Ngawi*. STIKES Bhakti Husada Mulia Madiun. Available at: http://repository.stikes-bhm.ac.id/636/1/1.pdf (Accessed: 15 December 2022).

Triyani, S., Meilan, N. and Purbowati, N. (2019) 'Hubungan antara Lama Pemberian ASI Eksklusif dengan Perkembangan Anak Usia 12-36 Bulan', *Jurnal Ilmu dan Teknologi Kesehatan*, 1(2), pp. 113–119. Available at: https://ejurnal.poltekkesjakarta3.ac.id/index.

php/jitek/article/view/137 (Accessed: 15 December 2022).

UNICEF (2018) *CAPTURE THE MOMENT Early initiation of breastfeeding: The best start for every newborn*. New York. Available at: https://data.unicef.org/topic/nutrition/infant-and-young-child-feeding/ (Accessed: 15 December 2022).

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NUTRITION EDUCATION, PHYSICAL ACTIVITY AND DIETARY HABITS IN DIABETES MELLITUS PATIENTS

Nuryani[1*], Wiwin I. Usman[2], Maesarah[2]
[1]Nutrition Department, Health Polytechnic of Gorontalo, Gorontalo
[2]Nutrition Major, Public Health Faculty, Gorontalo University, Gorontalo
*E-mail: nuryanigz@yahoo.id

ABSTRACT

The prevalence of Type 2 Diabetes Mellitus (T2DM) in Indonesian population aged 15 years increase based on a doctor's diagnosis, where DKI Jakarta is the province with highest prevalence of T2DM. Gorontalo Province itself experienced an increase prevalence of T2DM compared to Riskesdas 2013, the rose from 6.9%to 8.5%. This study aims to observe the effect of nutrition education on knowledge, physical activity and eating habits of Diabetes mellitus patients participating in Posbindu at Monano Health Center. This study uses a quantitative method with an analytical survey with a quasi-experimental approach.The sample of the study were diabetes mellitus patients who were participate in Posbindu. Using the total sampling technique where the population was sampled as many as 74 people then categorized 2 groups, intervention group and control group. Based on the results of bivariate analysis, obtained p value > α (α = 0.05) in the category of physical activity with test results showing p value = 0.271 > 0.05. The same thing also happened to carbohydrate intake with p value = 0.088 > 0.05. For knowledge and eating habits with fiber and protein intake, p < 0,05 was obtained. In conclusion, knowledge, eating habits with fiber and protein intake affect the provision of nutrition education to diabetes mellitus patients participating in Posbindu in the work area of Monano Health Center.

Keywords*: activity, diabetes mellitus, education, intake, knowledge*

ABSTRAK

Prevalensi penyakit Diabetes Melitus (DM) tipe 2 di Indonesia pada penduduk umur ≥ 15 tahun meningkat 0,5% (2013 – 2018) berdasarkan diagnosis dokter, sementara provinsi DKI Jakarta merupakan provinsi tertinggi kejadian DM tipe 2. Gorontalo sendiri mengalami kenaikan prevalensi diabetes jika dibandingkan dengan Riskesdas 2013, meningkat dari 6,9 persen menjadi 8,5 persen. Tujuan: Mengetahui pengaruh edukasi gizi terhadap pengetahuan, aktivitas fisik dan kebiasaan makan pasien Diabetes Melitus peserta Posbindu di wilayah kerja Puskesmas Monano. Metode: metode kuantitatif bersifat survey analitik dengan pendekatan quasi experiment (eksperimen semu). Sampel penelitian adalah pasien diabetes mellitus peserta posbindu. Menggunakan tehnik total sampling dimana populasi dijadikan sampel sebanyak 74 orang dibagi ke dalam dua kelompok yakni intervensi dan kontrol. Hasil: Berdasarkan hasil analisis bivariat, pengetahuan dan kebiasaan makan dengan asupan serat dan protein diperoleh nilai p < α (α = 0,05) sedangkan pada kategori aktivitas fisik didapatkan nilai p value = 0,271 < 0,05. Hal ini sama juga terjadi pada asupan karbohidrat nilai p value = 0,088 > 0,05. Kesimpulan: Pengetahuan, kebiasaan makan dengan asupan serat dan protein berpengaruh terhadap pemberian edukasi gizi pada pasien diabetes melitus peserta posbindu di wilayah kerja Puskesmas Monano tahun 2021.

Kata kunci: aktivitas, asupan, diabetes melitus, pendidikan, pengetahuan

INTRODUCTION

The International Diabetes Federation (IDF) explains that Diabetes Mellitus appears when insufficient insulin production in the pancreas or insulin cannot be used effectively in the body, DM exists as one of the considerable common chronic diseases in the world. Diabetes Mellitus is a degenerative disease that is tremendous concern because of part the four priority non-communicable diseases that are always increasing every year and the treatment to the world health in the current era (IDF, 2019).

Diabetes mellitus has now stepped into the global era and has evolved a world health problem issue. The incidence and prevalence of the disorder never stop flowing, especially in developing countries and countries that have already entered a culture of industrialization. Indonesia have efforts

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to achieve Universal Health Coverage (UHC) in 2030, 13,500 Integrated Development Posts (*Posbindu*) formed by the Ministry of Health to facilitate access for residents to carry out early detection of diabetes mellitus. In addition, people are encouraged to take CERDIK actions, namely regular health checks, stop smoke, physical activity at least 30 minutes a day, a balanced diet, get enough rest, manage stress well (Ministry of Health RI, 2018).

Approximately 422 million people in the world afflicted diabetes mellitus which is equal to in adult population amount increase around 8.5% that indicates the increment prevalence of DM in adult population. Estimated 2.2 million mortality cause of diabetes mellitus in age under 70 years, particularly in low middle economic countries. It is estimated will increase around 600 million people suffering with diabetes mellitus in 2035 (Ministry of Health RI, 2018). The American Diabetes Association (ADA) explains that every 21 seconds there is one person diagnosed with diabetes mellitus or nearly half of the adult population in America suffers from diabetes mellitus (ADA, 2019). Knowledge is the initial capital for respondents in carrying out a healthy lifestyle, attitudes, and practice in healthy lifestyle by implementing a strict and obedient diet diabetes. Knowledge is occurring after people sense a certain object as a result of "knowing". Knowledge about diet therapy can be obtained through consultation or education in health services (Notoatmodjo, 2012).

The prevalence of type 2 Diabetes Mellitus (T2DM) in Indonesian aged ≥ 15 years has increased from 1.5% in 2013 to 2.0% in 2018 based on doctor's diagnosis and DKI Jakarta is the highest prevalence of T2DM. The Gorontalo Province itself has experienced an increase when compared to the 2013 base on basic health survey, the increment diabetes mellitus from 6.9 percent to 8.5 percent (Riskesdas, 2018). Data from Analysis of Health Problems in North Gorontalo Regency in 2018, there were 2651 cases of T2DM out of a total of 28 diseases in North Gorontalo Regency and T2DM cases according to age were the highest at the age of 45-65 years (North Gorontalo Health Office, 2018).

Data from the Monano Public Health Center, North Gorontalo Regency in 2019 indicated that there were 74 people with diabetes mellitus, both type I and type II. According to the Monano Health Center, the number of diabetes mellitus patients continues to increase, compared to 2018 which reached 61 patients. The improving of patients DM is inseparable from the lifestyle that DM patients and their families live, considering that patients diabetes mellitus who live in rural areas have a lifestyle that majority eat a lot of sugar especially additional sugar and consume lots of carbohydrates are the dairy food consume by the societies. In addition to the lifestyle conditions of the village community, there are still diabetes mellitus sufferers who do not understand the meaning, intent and purpose of diet diabetes mellitus and lack of family support in implementing diet diabetes for patients. The aim of study was to assess effect of nutrition education on physical activity and dietary habits in diabetes mellitus patient.

METHODS

The research method used was quantitative research with an analytical survey with a quasi-experimental approach, namely an experimental research design conducted outside the laboratory to see the effectiveness nutrition education interventions programs on knowledge, eating habits and physical activity of Diabetes Mellitus Patients. In this model, before starting treatment, the two groups were given a pretest (baseline) to measure the initial conditions (O1). Furthermore, the experimental group was given treatment (X) and the control group was not given treatment. After finishing into one month the treatment, the two groups were given another test as a posttest (O2). With this scheme it can be seen that the effectiveness of the treatment was indicated by the difference between (O2 - O1) for experimental group and (O2 - O1) for control group. Intervention in the experimental group was carried out for one month. The experimental group will receive intervention with education about nutrition directly while the control group will be given brochures/ leaflets. After completion, a post test will be carried out as previously explained

The study was conducted in Monano Public Health Center, North Gorontalo Regency and carried out in February-April 2021. The population in the study was all diabetes mellitus patients who were participated in Posbindu the Monano Health Center as many as 74 T2DM respondents and the sample was taking by using total technique. The sample was categorized 2 groups, including intervention and control group. The intervention group 37 people, was given direct education and counseling interventions in the form of explanations related with diabetes mellitus and diabetes mellitus diet. Meanwhile, the control group was given brochures related to the diabetes mellitus diet. The intervention was carried out for 1 month. The research has obtained permission from the research code of ethics, the Ethics Commission Faculty of Public Health, Hasanudin University (KEPK UNHAS) with protocol number 19821041203.

RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents Diabetes Mellitus Patients

Characteristics	Intervention Group		Control Group	
	n	%	n	%
Gender				
Male	5	13,5	9	24,3
Female	32	86,5	28	75,7
Level of education				
Elementary school	29	78,4	28	75,7
Junior high school	3	8,1	4	10,8
Senior high school	2	5,4	3	8,1
University	3	8,1	2	5,4
Occupation				
Yes	7	18,9	9	24,3
No	30	81,1	28	75,7
Duration suffering T2DM				
< 2 year	6	16,2	8	21,6
2 – 5 year	29	78,4	29	78,4
> 5 year	2	5,4	0	0

Table 1 was showed that percentage of the sexes of the two groups was mostly female in the intervention group of 86.5% and the control group of 75.7%. Characteristics of subject study based on education level in the intervention group were almost all in elementary school students, namely 29 people (78.4%), while in the control group, most of them were elementary school students, namely 28 people (75.7%). The characteristics of subject based on occupational in intervention group were amount 30 people (81.1%) did not work, while in the control group most did not work as many as 28 people (75.7%). Subject characteristics based on the duration of suffering diabetes melitus type 2 (T2DM) in the both groups were mostly 2-5 years as many as 29 people (78.4%).

Description of knowledge, physical activity and eating habits, namely intake of carbohydrates, protein and fiber in T2DM in the intervention and control groups before and after nutrition education was showed in Table 2. Education in this study focuses on diet/meal arrangements in T2DM which includes knowledge of the amount, type and schedule of meals or known as 3J (amount food consumption, time consumption, type of food). The results of the research presented in Table 2 was showed that in the intervention group there was sufficient increase in knowledge of 43.3% after educational intervention was carried out, increase percentage of knowledge in the control group by 16.3% after intervention. Before and after nutrition education programs, there were significant difference in knowledge p value = 0.276 before education, while after education p value = 0.000.

The physical activity and dietary intake before and after intervention was showed in Table 2. The intervention group there was an increase in moderate physical activity 7% after nutrition education, but in control group was increased also in the percentage of moderate physical activity 2% after nutrition education. The behavior change not different significant before and after intervention nutrition education which was carried out in the intervention and control groups with a p value = 0.271. The dietary intake was showed that in the intervention group there was increased in adequate food intake 10-15% after nutrition education, and there an increase in the percentage of adequate food intake in the control group 5% after nutrition education. The significant differences in food intake after nutrition education in the intervention and control groups, respectively, with p values = 0.088 (carbohydrates), 0.002 (protein) and 0.000

(fiber) after nutrition education, whereas before nutrition education was carried out in the control and intervention groups with p value = 0.713 (carbohydrate), 0.004 (protein) and 0.310 (fiber). The study indicates an increase in the score of food intake after nutrition education in T2DM. Nutrition education can increase food intake in T2DM. Table 2 was showed that nutrition education can increase knowledge about food choice in T2DM in Monano Health Center. There was a significant increase in knowledge about eating pattern in the intervention group.

Table 2. The difference before and after intervention in knowledge, physical activity and dietary intake

Variablel	Before	After	*p value*
	Mean ±SD	**Mean ±SD**	
Knowledge			
Intervention	56,75±15,68	73,78±8,77	0,000*
Control	60,54±16,06	62,29±14.26	0,002*
Physical activity			
Intervention	1,58±0,27	1,56±0,27	0,567
Control	1,54±0,15	1,51±0,15	0,156
Protein intake			
Intervention	47,45±10.48	65,73±17.84	0,000*
Control	56,56±15.67	53,71±14.91	0,389
Carbohydrat intake			
Intervention	250,40±51,03	274,41±59,63	0,063
Control	245,92±53,37	251,80±52,49	0,570
Fiber intake			
Intervention	9,62±4.48	26,29±8,96	0,000*
Control	10,60±3.72	16,94±9,89	0,001*

The age of research subject with T2DM was predominantly > 35 years old. Age is one of the factors that can affect knowledge because according to Mubarak (2017) with increasing age a person will experience changes in the physical and psychological (mentally) aspects, in this case the respondent's knowledge about diabetes mellitus diet management. The results were explained that nutrition education has a significant influence on physical activity in people with diabetes mellitus because education is an interactive process that can encourage learning process and an effort to increase attitudes, knowledge, and practice through strengthening experiences and practices (Potter & Perry, 2009).

The evaluation of results study in the counseling intervention process showed that 100% of patients did not know the schedule, type and amount of food that should be consumed, and were unable to manage food portions. Counseling accompanied by carbohydrate counting material to patients and families that cause they can able to change patient behavior and eating patterns. During the counseling process, examples of photographs of several portions of food, exchange standards, and household size were given (Agung, 2019). The successful of implementation developd nutrition education in this study can also be due to the fact that the intervention group has been given structured education about eating arrangements in patients with diabetes mellitus which was held in 4 meetings, each meeting 60 minutes, with different material, which was carried out using the group education method with lectures so that it was more frequent. discussing during the implementation of education between respondents and researchers. This was also evidenced by the answers to the knowledge score of the respondents who experienced an increase after given education. Based on a systematic review conducted by Norris, (2011) found that there was a different impact between education carried out in groups and

individually, especially those related to controlling diet and physical activity, which were considered better in the group approach.

Diabetes mellitus generally occurs when lifestyle and activity patterns have been established. Success in diabetes self-management requires the active participation of sufferers, families and communities. The health team accompanies patients in changing behavior towards daily activities. Changing activity can be made by comprehensive education and development. Education (counseling) and approach-based problem solving is the core for support behavior change (Soelistijo dkk, 2021). Behavior change is almost the same as the educational process and requires assessment, plan, implementation, documentation and evaluation. The success of education in achieving the target will be more able to ensure compliance with diabetes mellitus in carrying out the management of diabetes mellitus properly (Soelistijo dkk, 2021). Another characteristic factor was that most of the respondents age >35 years old, where with maturity a person's age can influence a person's psychology which can ultimately affect changes in attitudes for the better towards the intake they consume. The frequency of visits of people with diabetes mellitus to the Monano Health Center routinely makes them obtain information about the disease and its pharmacological and non-pharmacological management.

CONCLUSION

There was no relationship between nutrition education and eating habits (carbohydrate intake) and physical activity of diabetes mellitus patients participating in Posbindu in the Monano Health Center work area. Meanwhile, patient knowledge of eating habits (fiber, protein intake) has a relationship to nutrition education. It is necessary to carry out intensive education about diabetes mellitus in relation to its nutrition. Improving public health services, especially in nutrition programs to increase knowledge about diabetes mellitus in Posbindu participants.

REFERENCES

ADA. (2018). "*Standar Of Medical Are In Diabetes 2019"*. Vol. 42. USA: ADA.

Agung Puruhita, T.K. (2019). *Edukasi Gizi Bagi Pasien Diabetes Mellitus Tipe* 2 : Poltekkes Tasikmalaya, 1–5.

IDF. (2019). *IDF DIABETES ATLAS (9th ed.)*. BELGIUM: IDF

Kemenkes RI. (2018). *InfoDATIN 2018 (p. 8)*. Jakarta Selatan: Kemenkes RI

_____. (2018). *Hasil Utama Riset Kesehatan Dasar*. Jakarta Selatan: Kemenkes RI

Mubarak dkk. (2017). *Ilmu Kesehatan Masyarakat : Teori dan Aplikasi*. Jakarta: Salemba Medika; 2017.

Norris S.L, et al (2011). *Increasing Diabetes Self-Management Education in Community Settings A systematic Review*. American Journal of Preventive Medicine : Elsevier Science Inc.

Notoatmodjo, S. (2012). *Promosi kesehatan dan ilmu perilaku*. Jakarta: Rineka Cipta.

Potter, P. A., & Perry, A. G. (2009). *Fundamental keperawatan. Buku 2 edisi 7*. Jakarta : Salemba medika.

Soelistijo SA, Suastika K, Lindarto D, Decroli E, Permana H, Sucipto KW, Kusnadi Y, Budiman, Ikhsan MR, Sasiarini L, Sanusi H, Nugroho KH, Susanto H. (2021). *Pedoman Pengelolaan Dan Pencegahan Diabetes Melitus Tipe 2 Dewasa Di Indonesia*. Jakarta: PB. Perkeni.

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EFFECTIVENESS OF NUTRITION EDUCATION TO REDUCE THE RISK OF SPORTS INJURY IN YOUNG SOCCER ATHLETES

Yuni Afriani[1*], Siska Puspita Sari[1], Adi Sucipto[2], Desty Ervira Puspaningtyas[1], Cindy Nur Elityasari[1], Andika Setiawan[1]
[1]Nutrition Program, Faculty of Health Sciences, Universitas Respati Yogyakarta, Indonesia
[2]Nursing Program, Faculty of Health Sciences, Universitas Respati Yogyakarta, Indonesia
*E-mail: yuni_afriani@respati.ac.id

ABSTRACT

Physical exercise is the main factor in improving the performance of athletes. Physical exercise may cause fatigue and increase the risk of injury. Most athletes have experienced injuries during training or competing, such as muscle pain, sprains, muscle tension, bruises, and minor injuries. The majority of athletes lack knowledge regarding the management of injuries through appropriate nutritional interventions. The importance of proper nutrition therapy education as one of the solutions to reduce the risk of sports injury. The purpose of this study was to observe the change in knowledge about proper nutritional therapy in dealing with injuries in young soccer athletes at PSS Sleman Development Center. The study was conducted in July 2022. The provision of education was given at the Macanan Field, Prambanan, Yogyakarta. The respondents were 22 U-16 athletes at PSS Sleman Development Center. Athletes were given a knowledge questionnaire before and after the provision of education. Data were analyzed using statistical software with descriptive analysis and Wilcoxon Signed Rank Test. The increase in athletes' knowledge was measured from the knowledge score before giving education, which was 86,36 and after being given education increased to 89,09 with an average difference of 2,73 (p=0,366). The maximum score after providing education is 100 with a minimum score of 60. Providing education to athletes can increase athlete's knowledge and understanding of the importance of proper nutritional intake in reducing the risk of sports injury.

Keywords: *nutrition education, soccer athletes, sport injuries*

ABSTRAK

Latihan fisik merupakan faktor utama dalam meningkatkan prestasi atlet. Latihan fisik dapat menyebabkan kelelahan dan meningkatkan risiko cedera. Sebagian besar atlet pernah mengalami cedera saat latihan atau bertanding, seperti nyeri otot, keseleo, ketegangan otot, memar, dan cedera ringan. Mayoritas atlet kurang memiliki pengetahuan tentang penanganan cedera melalui intervensi nutrisi yang tepat. Pentingnya edukasi terapi nutrisi yang tepat sebagai salah satu solusi untuk mengurangi resiko cedera olahraga. Tujuan dari penelitian ini adalah untuk mengetahui perubahan pengetahuan tentang terapi nutrisi yang tepat dalam mengatasi cedera pada atlet sepak bola muda di PSS Sleman Development Center. Kajian dilakukan pada Juli 2022. Pemberian pendidikan diberikan di Lapangan Macanan, Prambanan, Yogyakarta. Responden adalah 22 atlet U-16 di PSS Sleman Development Center. Atlet diberikan angket pengetahuan sebelum dan sesudah pemberian pendidikan. Data dianalisis menggunakan software statistik dengan analisis deskriptif dan Wilcoxon Signed Rank Test. Peningkatan pengetahuan atlet diukur dari skor pengetahuan sebelum diberikan penyuluhan yaitu 86,36 dan sesudah diberikan penyuluhan meningkat menjadi 89,09 dengan selisih rata-rata 2,73 (p=0,366). Skor maksimal setelah memberikan edukasi adalah 100 dengan skor minimal 60. Pemberian edukasi kepada atlet dapat meningkatkan pengetahuan dan pemahaman atlet akan pentingnya asupan nutrisi yang tepat dalam mengurangi risiko cedera olahraga.

Kata kunci: atlit sepakbola, cedera, edukasi gizi

INTRODUCTION

The achievements of national soccer athletes are still a concern that needs to be improved. Indonesian national team still has not qualified for the AFF Cup in 2014 and 2022 and also other competitions (Nurikhsani, 2022). A High number of cases of injury on the national team is one of the factors that affect the performance of athletes. Many Indonesian soccer athletes have an unconscious Anterior Cruciate Ligament (ACL)

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disorder. Players who have problems with ACL will get sicker and decrease in performance during the match (Fajriyah, 2016). Severe cases of injury were experienced several times by the Indonesian national team during the 2004 AFF Cup, the 2007 Asian Cup, the 2018 PSSI Anniversary Cup, and the 2019 FIFA. This condition makes it take a long time for players to recover to return to play on the field (Adiyaksa, 2019).

Physical exercise is performed to improve the physical abilities and performance of athletes. It can also have a negative effect, namely, the risk of injury causing pain, bruising, and swelling, if not done appropriately, measurably, and systematically. Injuries can be influenced by several factors, namely physical condition, improper movement, unbalanced muscles, lack of heating, physical contact, environment, and fatigue. Athletes with strenuous physical exercise and long duration have an impact on dehydration conditions and decreased blood glucose, resulting in fatigue and increasing the risk of injury (Setiawan, 2011; Murray, 2007).

Optimal nutritional intake strongly supports performance improvement by delaying the occurrence of fatigue and lowering the risk of sports injury. Improper nutritional intake is one of the triggers for the occurrence of a larger injury condition. The nutritional needs of an athlete are influenced by age, weight, gender, physical activity, and sports activity. The fulfillment of appropriate nutritional intake based on the amount, type, and schedule strongly supports the optimal performance of athletes. Despite this, there are still many athletes with an improper intake of food and fluids. There are still many athletes who have never received education about the increase in appropriate nutritional intake in supporting the success of athletes when competing (Zahra and Muhlisin, 2020; Kementerian Kesehatan RI, 2013). Athletes' knowledge of sports injuries is very important so that athletes can easily, quickly, and precisely perform first aid both self-inflicted and through the help of others (Rosintan & Napitupulu, 2021; Mubarok, Afif Julianto, & Dai, 2021).

PSS Sleman Development Center is one of the soccer clubs in Yogyakarta that is included in the national league. Food intake in PSS Sleman Development Center athletes has not been included in the good category. The nutritional intake of athletes is still below the daily needs of athletes. Athletes consume daily energy of 1,802.11 kcal, protein 60.5 grams, fat 67.3 grams, and carbohydrates 265.5 grams. The daily intake of this athlete was only met by 200 kcal above the basal energy requirement of 1598.22 kcal (Puspaningtyas et al., 2021). The results of another study explained that the selection of the type of fluid and the amount of fluid consumed by athletes was not by following the needs and periodization of exercise. 96% of athletes consume fewer fluids than requirements (Afriani et al., 2022).

A preliminary study on ten athletes at the PSS Development Center found that 70% of athletes had experienced injuries during training and competition. Injuries that often occur are bruises, sprains, and abrasions. Most athletes also do not know the proper handling of injuries. (Puspaningtyas et al., 2021).

The selection of the right nutritional intake can reduce the incidence of injury and accelerate the recovery process and optimal performance in athletes (Mahastuti et al., 2018). Efforts to provide education to football schools have proven to be able to improve athletes' knowledge about the principles of balanced nutrition (Puspaningtyas et al., 2019; Sari et al., 2018). Efforts to increase knowledge about nutrition therapy in handling injuries in football athletes PSS Sleman Development Center need to be carried out as a solution to athletes' independence in dealing with injury problems during training or competing.

METHODS

This research was quasi-experimental with a pre-post design. This research was conducted in July-August 2022. The respondents of this study were 22 U-16 athletes selected using the purposive sampling method. Research Education was conducted at the PSS Sleman Development Center Office, namely Macanan Field, Prambanan, Yogyakarta.

Nutrition education is carried out through lecture and discussion methods with athletes for one day. Education is done once for 100 minutes. The educational material is "The Role of Nutrition

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in Handling Athlete Injuries". This material is based on the results of preliminary studies, namely the high cases of injuries not realized by athletes developed by the researcher. In addition, many athletes do not understand the importance of nutrition in dealing with injuries. This education contains the importance of nutrition to prevent injuries, and the selection of correct foodstuffs to overcome injuries before, during, and after training and competing.

Athletes fill out a knowledge questionnaire before and after providing education. The research data were analyzed with statistical software through descriptive analysis. The data were displayed showing median (min-max). Changes in knowledge scores after education were analyzed using the Wilcoxon Signed Rank test because the data was not distributed normally.

RESULTS AND DISCUSSIONS

Providing education for athletes can increase athletes' knowledge and understanding of proper nutrition and injury management in athletes. Education is a communication method for a group of people that can provide positive changes in knowledge, attitudes, and behavior. Several studies explain that direct and online nutrition education can effectively increase athletes' knowledge scores in implementing balanced nutrition (Waryana and Wijanarka, 2013; Puspaningtyas et al., 2019; Puspaningtyas et al., 2021).

Table 1. The Effect of Nutrition Education on Knowledge Score of Young Soccer Athletes

Description	Pre test Median (Min-Max)	Post test Median (Min-Max)	*P value*
Knowledge Score	90 (40-100)	100 (60-100)	0,366*

**Wilcoxon Signed Rank Test*

Table 1. shows that nutrition education can increase knowledge scores in adolescent athletes by 2.73 points. However, statistically, the increase in knowledge has not changed significantly. Many athletes still think that nutrition is not yet important in injury prevention. They do not know the types of nutrients such as carbohydrates, proteins, fats, vitamins and minerals and their importance in preventing injuries. This is in line with previous research that providing online education on the prevention and management of sports injuries in the field of nursing can increase athletes' knowledge and understanding of sports injury management, but not significantly increased (Sucipto et al., 2022).

Educational materials, well media are needed to increase the acceptance of information (Notoatmojo, 2010). Education or mentoring to athletes can increase their knowledge and understanding of athletes. Increased knowledge can be applied to choose foods and drinks that suit the needs and periodization of exercise so that nutritional status and hydration status become normal and reduce the risk of injury (Brand, 2018). The comparison of pre-post test scores of athletes is displayed in Figure 1.

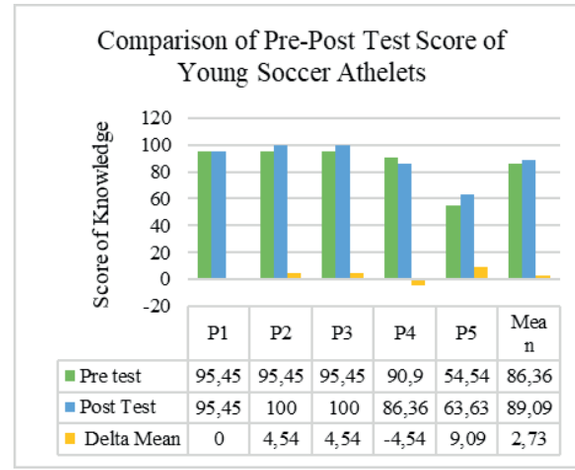

Figure 1. Comparison of Pre-Post Score of Young Soccer Athletes

Based on Figure 1. it is known that question 1 about "Free radicals can cause inflammation" is already very well understood by athletes, only one athlete who answers incorrectly. Free radicals are one of the factors that aggravate the condition of the injury. Physical exercise in the field will produce free radicals followed by a decrease in antioxidant enzymes. The intensity and type of exercise affect the level of oxidative stress. Athletes need food intake or sources rich in antioxidants in helping to ward off free radicals in athletes to lower the rate of inflammation (D' Angelo and Rosa, 2020; Koivisto et al., 2019; Dzuvo et al., 2014)

The second question is "The consumption of burnt food can lower the risk of injury". On this question is a negative statement that should be the answer is false. The post-test score has increased, which is 100% of athletes answered correctly after providing education. The prevalence of consumption of burned food based on Riskesdas (2018) is 30.6% 1-6 times a week with a contribution to the adolescent age range (15-19 years) of 38.3% of the total population.

Food processed by burning with charcoal contains polycyclic aromatic hydrocarbons that have an impact on increasing inflammation in the body (Sjamsuhidajat, Karnadihardja & Rudiman, 2010). Not all foods that contain fat will trigger inflammation in the body. Animal foods including red meat and egg have a positive effect on the body can potential for pro-inflammation may be suppressed by combining food intake that is high in fiber (Grosso et al., 2022).

The third question is "Whether vitamin C is one type of antioxidant that accelerates recovery". After providing education, 100% of athletes answer with the correct answers. Vitamin C is one type of vitamin that functions as an antioxidant. Antioxidants have an important role in reducing the rate of inflammation in the body. Vitamin C is a cofactor that is very important in metabolic processes in the body and helps the synthesis of hormones (Dosedˇel et al., 2021).

Vitamin C consumed around 0.2 - 1 gr/day can reduce oxidative stress in athletes. Consumption of vitamin C over the recommendations can reduce mitochondrial biogenesis and alter vascular function. It is supported by the results of research that states that athletes' antioxidant needs should be from natural sources, namely food sources of vitamins and minerals, namely vegetables and fruits that have a high content of antioxidants and bioactive substances (Braakhuis, 2012; Higgins et al., 2020).

The fourth question is "Lack of fluid does not aggravate the condition of the injury." In this fourth question, there is a decrease in the score, one athlete answered correctly during the pretest, and in the posttest, the answers to questions were incorrect. It is due to many factors. One of the reasons is the use of educational media. According to several studies, attractive and effective educational media are needed to support successful education by increasing knowledge scores significantly (Kapti, 2016; Putriana & Dieny, 2014; Susanti et al., 2018). It is one that needs to be improved in the educational process to be more accepted by adolescent athletes.

Fluids play an important role in improving the balance of fluids and electrolytes in the body. The body that lacks fluids, will easily experience an increase in core body temperature which has an impact on heat stroke conditions (McCartney et al., 2017). This condition makes it very easy for athletes to suffer injuries during training or competing. Fluid volume and fluid intake selection are also important for the body to be optimally hydrated (Murray, 2007; Meyer, 2016). Another study mentioned that consuming drinks with carbohydrates and electrolytes can improve performance and prevent the occurrence of injuries (O'Reilly & Wong, 2013). Consumption of maltodextrin-based drinks and vitamin C can also improve mood, reduce the risk of injury, and optimal athlete performance (Afriani, Hadjam & Farmawati, 2017).

The fifth question is "A low-glycemic diet can delay muscle fatigue". Most athletes still do not understand the concept of a low-glycemic diet, as seen fair low pretest score, after providing education, the knowledge score of these related athletes has increased, although not 100% of athletes can understand this concept. Foods with a low glycemic index are foods with IG content (≥ 55) with food ingredients such as brown rice, seeds, beans, pasta, sweet potatoes, corn, full cream and skim milk, vegetables, and fruits (Kuswari & Gifari, 2020). A low-glycemic diet can increase athlete endurance compared to athletes who consume foods high in the glycemic index before exercise. Athletes' lactic acid levels have a higher tendency in athletes with a high glycemic index diet (Pambudi & Fauzi, 2019).

Injuries to athletes must be treated immediately so that the condition does not get worse and affects the athlete's performance. Decreased performance in athletes will result in a decrease in achievement, especially in group athletes (Mubarok, Afif Julianto and Dai, 2021). Nutrition education with appropriate media necessary for athletes provided by a nutritionist

(Susanti et al., 2018; Kementerian Kesehatan RI, 2021). Therefore, education using attractive and effective educational media for athletes is needed to increase their knowledge and understanding of appropriate nutritional support. It is very important in preventing, helping to repair, and recover the condition of injuries to athletes so that athletes' performance increases and achievements when competing.

CONCLUSION

Providing education to athletes can increase athlete's knowledge and understanding of the importance of proper nutritional intake in reducing the risk of sports injury. There was an increase in the average score of sports injury prevention and management knowledge by 2.73 points before and after education. It is necessary to modify the use of educational media to increase the knowledge of athletes.

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REFERENCES

Adiyaksa, M. 2019. 3 Pemain yang Cedera Parah Saat Membela Timnas Indonesia. HYPERLINK "https://www.bola.com/indonesia/read/3988472/3-pemain-yang-cedera-parah-saat-membela-timnas-indonesia" https://www.bola.com/indonesia/read/3988472/3-pemain-yang-cedera-parah-saat-membela-timnas-indonesia . May 11, 2022 (15:00).

Afriani, Y., Hadjam, N.R, Farmawati, A. 2017. Pemberian minuman kombinasi maltodekstrin dan vitamin C terhadap mood negatif dan VO2 maks atlet sepak bola. Jurnal Gizi Klinik Indonesia, 13 (4): 196-204.

Afriani, Y., Sari, S., Sucipto, A., & Puspaningtyas, D. 2022. Optimalisasi Asupan Cairan dengan Tekanan Darah dan Denyut Nadi pada Atlet PS Sleman Development Center. *Jurnal Pengabdian Pada Masyarakat*, *7*(1), 80-86.

Braakhuis, A.J. 2012. Effect of Vitamin C Supplements on Physical Performance. Current Sports Medicine Reports, 11 (4): 180-184.

Brand, N.A. 2018. Survey of Hydration Knowledge and Behavior in Youth Mountain Bike Teams. Theses and Dissertations. University of Arkansas. Arkansas.

D'Angelo, S., & Rosa, R. 2020. Oxidative Stress And Sport Performance. *Sport Science 13 Suppl 1*, 18-22.

Dosedˇel, M.; Jirkovský, E.; Macáková, K.; Krˇcmová, L.K.; Javorská, L.; Pourová, J.; Mercolini, L.; Remião, F.; Nováková, L.; Mladˇenka, P. 2021. Vitamin C—Sources, Physiological Role, Kinetics, Deficiency, Use, Toxicity, and Determination. Nutrients, 13, 615.

Džuvo, A. H., Valjevac, A., Lepara, O., Pjanić, S., Hadžimuratović, A., & Mekić, A. 2014. Oxidative stress status in elite athletes engaged in diff erent sport disciplines. *Bosn J Basic Med Sci 14 (2)*, 58-62.

Fajriyah, T. 2016. Pemain Timnas Indonesia Sering Abai Cedera ACL. https://www.cnnindonesia.com/olahraga/20161104091602-147-170159/pemain-timnas-indonesia-sering-abai-cedera-acl. May 11, 2022 (16.00).

Grosso, G.; Laudisio, D.; Frias-Toral, E.; Barrea, L.; Muscogiuri, G.; Savastano, S.; Colao, A. 2022. On behalf of the Obesity Programs of Nutrition, Education, Research and Assessment (OPERA) Group Anti-Inflammatory Nutrients and Obesity-Associated Metabolic-Inflammation: State of the Art and Future Direction. Nutrients, 14, 1137.

Higgins, M.R., Izadi, A., Kaviani, M. 2020. Antioxidants and Exercise Performance: With a Focus on Vitamin E and C Supplementation. Int. J. Environ. Res. Public Health 17, 8452; doi:10.3390/ijerph17228452

Kapti, R.E. 2016. Efektifitas audiovisual sebagai media penyuluhan kesehatan terhadap peningkatan pengetahuan dan sikap ibu dalam tatalaksana balita dengan diare di dua rumah sakit kota malang. Skripsi. FKM, Gizi, Universitas Indonesia. Jakarta.

Kementerian Kesehatan RI. 2013. *Pedoman Gizi Olahraga Prestasi*. Kementerian Kesehatan RI. Jakarta.

Kementerian Kesehatan RI. 2018. Laporan Kesehatan Nasional RISKESDAS. Kementerian Kesehatan RI. Jakarta.

Kementerian Kesehatan RI. 2021. Panduan Pendampingan Gizi pada Atlet. Kementerian Kesehatan RI. Jakarta.

Koivisto, A. E., Olsen, T., Paur, I., Paulsen, G., Bastani, N. E., Garthe, I., et al. 2019. Effects of antioxidant-rich foods on altitude-induced oxidative stress and inflammation in elite endurance athletes: A randomized controlled trial. *PLoSONE 14(6)*, 1-19.

Kuswari, M., Gifari, N. 2020. Periodisasi Gizi dan Latihan. Rajawali Pers. Depok.

Mahastuti, F., Rahfiludin, Z., & Suroto. 2018. Hubungan Tingkat Kecukupan Gizi, Aktivitas Fisik Dan Kadar Hemoglobin Dengan Kebugaran Jasmani (Studi Pada Atlet Basket Di Universitas Negeri Semarang). Jurnal Kesehatan Masyarakat (e-Journal), 6(1), 458–466.

McCartney, D., Desbrow, B., Irwin, C. 2017. The Effect of Fluid Intake Following Dehydration on Subsequent Athletic and Cognitive Performance: a Systematic Review and Meta-analysis. Sports Medicine - Open. 3 (13): 1-23.

Meyer, F., Szygula, Z., Wilk, B. 2016. Fluid Balance, Hydration, and Athletic Performance. CRC Press. New York.

Mubarok, K., Afif Julianto, M., & Dai, M. 2021. *Pencegahan Cedera Dalam Permainan Sepak Bola*. *1*(2), 2774–9754.

Murray, B. 2007. Hydration and Physical Performance. Journal of the American College of Nutrition, 26 (5), 542S–548S.

Notoatmodjo, S. 2010. *Promosi Kesehatan dan Ilmu Perilaku.* PT. Rineka Cipta. Jakarta.

Nurikhsani, G. 2022. Data Lengkap Prestasi Timnas Indonesia di SEA Games. HYPERLINK "https://www.bola.com/indonesia/read/4933077/data-lengkap-prestasi-timnas-indonesia-di-sea-games" https://www.bola.com/indonesia/read/4933077/data-lengkap-prestasi-timnas-indonesia-di-sea-games . May 11, 2022 (16:30).

O'Reilly, J., Wong, S.H. 2013. Effect of a carbohydrate drink on soccer skill performance following a sport-specific training program. Journal of Exercise Science & Fitness 11: 95-101.

Pambudi, B.I., Fauzi, E.R. 2019. Makanan Indeks Glikemik dari Anaerobic Shuttle Test dalam Melihat Daya tahan Atlet Bulutangkis. Jurnal Dunia Gizi, 2 (2): 94-100.

Puspaningtyas, D. E. *et al.* 2019. 'Edukasi Gizi Efektif Meningkatkan Pengetahuan Atlet Mengenai Gizi Seimbang Dan Pemenuhan Kebut uhan Cairan', *Jurnal Pengabdian Dharma Bakti*, 2(2).

Puspaningtyas, D. E. et al. 2021. 'Pendampingan Pengaturan Makan Atlet Akademi PS Sleman Menggunakan Aplikasi Diet Berbasis Online'. Universitas Respati Yogyakarta: Laporan Pengabdian Masyarakat.

Putriana, D., Dieny, F.F. 2014. Konsumsi Cairan Periode Latihan Dan Status Hidrasi Setelah Latihan Pada Atlet Sepak Bola Remaja. Skripsi. Universitas Diponegoro. Semarang.

Rosintan, & Napitupulu, M. 2021. Pencegahan Dan Penanganan Cedera Olahraga Pada Siswa Sekolah Menengah Kejuruan Negeri 10 Cawang. *Jurnal Fisioterapi Dan Rehabilitasi*, *5*(1), 76–95.

Safitri, D. A., Khusniya, I., & Dai, M. 2021. *Pengetahuan Dan Penanganan Cidera Berat Pada Atlet Karate*. *1*, 97–105.

Sari, S. P., Afriani, Y. Puspaningtyas, D.E. Mukarromah, N. 2018. 'Gambaran Sikap Atlet Mengenai Gizi Seimbang dan Pemenuhan Kebutuhan Cairan', *Berita Kedokteran Masyarakat*, 34(11).

Setiawan, A. 2011. Faktor Timbulnya Cedera Olahraga. Jurnal Media Ilmu Keolahragaan Indonesia, 1 (1): 94-98.

Sjamsuhidajat, R.; Karnadihardja, W.; Prasetyono,T.O.H.; Rudiman, R., 2010. Sjamsuhidajat-De Jong: Buku Ajar Ilmu Bedah. Edisi 3. EGC. Jakarta. pp: 619-37.

Sucipto, A., Puspaningtyas, D.E., Afriani, Y., Sari, S.P. 2022. Pengetahuan dan Penanganan Cidera Olahraga Atlet PS Sleman Development Center Melalui Edukasi Online. Jurnal Pengabdian "Dharma Bakti" 5 (2): 85-94.

Susanti, R., Sofiyatin, R., Abdi, L.K. dan Luh Suranadi. 2018. Pengaruh Pendidikan Gizi Melalui Media Buku Sakudengan Metode Ceramah Terhadap Pengetahuan Gizi Atlet di Pusat Pendidikan Dan Latihan Pelajar (PPLP) Provinsi Nusa Tenggara Barat Tahun 2018. Jurnal Gizi Prima. 3 (2): 93-99.

Waryana and Wijanarka, A. 2013. *Dasar-dasar Ilmu Komunikasi Gizi*. Penerbit Fitramaya. Yogyakarta.

Zahra, S., Muhlisin. 2020. Nutrisi Bagi Atlet Remaja. JTIKOR (Jurnal Terapan Ilmu Keolahragaan), 5 (1): 81-93.

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NUTRITIONAL VALUE OF MACKEREL FISH FLOUR (*RASTRELLIGER SP.*) WET NOODLES FORTIFIED WITH VEGETABLE FLOUR

Ayu Bulan Febry[1*], Liean A. Ntau[1], Mahyudin Bami[1]
[1]Jurusan Gizi Poltekkes Kemenkes Gorontalo, Gorontalo
*E-mail: ayubulan@poltekkesgorontalo.ac.id

ABSTRACT

Wet noodles available on the market are often lacking in adequate nutrition, with higher carbohydrates, lower protein, and fewer vitamins. Thus, develop a healthy, economical, and nutritious wet noodles using local ingredients is needed. The study aimed to investigate the enhancement of nutritional value in wet noodles by fortifying them with vegetable flour and mackerel flour. The study useda true experimental design with a posttest-only control group. The design used a complete randomized design consisting of three treatments and four replications. The three treatments were as follows: F0 (wet noodles with fish flour increased by 10 grams of vegetable flour); F1 (wet noodles with fish flour increased by 15 grams of vegetable flour);and F2 (wet noodles with fish flour increased by 20 grams of vegetable flour). The researchers analyzed the nutritional composition of the noodles, focusing on carbohydrates, proteins, fats, and iron. The findings of the study showed that the carbohydrate content in the three treatments of wet noodles with increased vegetable flour ranged from 14.3% to 16.7%. The protein content in the treatments ranged from 8.61% to 9.22%. The fat content varied from 2.62% to 2.9%. Moreover, the iron content in the treatment of wet noodles with increased vegetable flour ranged from 22.08 mg/kg to 25.76 mg/kg. The result of the ANOVA statistical test showed that there was a significant difference in the addition of vegetable flour to the iron content of mackerel meal wet noodles.

Keywords: *wet noodles, nutritional composition, fortified noodle, fish flour, and mackerel.*

ABSTRAK

Mie basah yang tersedia di pasaran seringkali kurang memiliki gizi yang cukup, dengan kandungan karbohidrat yang lebih tinggi, protein yang lebih rendah, dan vitamin yang lebih sedikit. Untuk itu, perlu dilakukan pengembangan produk mie basah yang sehat, ekonomis, dan bergizi dengan menggunakan bahan lokal. Penelitian ini bertujuan untuk mengetahui peningkatan nilai gizi mie basah dengan cara memfortifikasinya dengan tepung nabati dan tepung ikan kembung. Studi ini dilakukan dengan menggunakan desain eksperimental sejati dengan kelompok kontrol posttest-only. Rancangan menggunakan rancangan acak lengkap yang terdiri dari tiga perlakuan dan empat ulangan. Ketiga perlakuan tersebut adalah sebagai berikut: F0 : Mie basah dengan tepung ikan ditambah 10 gram tepung sayur; F1 : Mie basah dengan tepung ikan ditambah 15 gram tepung sayur; dan F2 : Mie basah dengan tepung ikan ditambah 20 gram tepung sayur. Para peneliti menganalisis komposisi nutrisi mie, dengan fokus pada karbohidrat, protein, lemak, dan zat besi. Hasil uji statistik ANOVA menunjukkan adanya perbedaan yang signifikan pada kandungan besi mie basah bungkil ikan kembung dengan penambahan tepung sayur. Hasil penelitian menunjukkan bahwa kandungan karbohidrat pada ketiga perlakuan mi basah dengan penambahan tepung nabati berkisar antara 14,3% sampai 16,7%. Kandungan protein pada perlakuan berkisar antara 8,61% sampai 9,22%. Kandungan lemak bervariasi dari 2,62% hingga 2,9%. Sedangkan kandungan besi pada perlakuan mi basah dengan penambahan tepung nabati berkisar antara 22,08 mg/kg hingga 25,76 mg/kg. Hasil uji statistic ANOVA menunjukkan bahwa terdapat perbedaan yang signifikan penambahan tepung nabati terhadap kadar besi mie basah tepung ikan ikembung.

Kata kunci: mi basah, komposisi gizi, mi fortifikasi, tepung ikan, ikan kembung

INTRODUCTION

As the Indonesian food industry expands rapidly on a small, medium, and large scale, it is critical to monitor the products produced. In their work, Dwi Jayati and Agustina (2018) asserted that the wet noodle industry is one of Indonesia's fastest-growing food industries.Wet noodles, according to the National Standardization Agency (KD Arsiti Rahayu A, 2016), are wet food products

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prepared from wheat flour with or without the addition of other permissible or impermissible food components; are shaped like non-dried noodles.

These days, wet noodles available on the market are not nutritionally adequate since they contain higher carbohydrates, lower protein, and fewer vitamins. Conforming to the Directorate of Nutrition of the Ministry of Health of the Republic of Indonesia (2005), the nutritional content, particularly the protein level, of noodle products and preparations remains relatively poor (KD Arsiti Rahayu A, 2016).

Statistical data on marine capture fisheries production of Gorontalo province, shows that fish production in Gorontalo province is 126,099 tons in 2021. The production commodity of mackerel in Hulonthalangi sub-district of Gorontalo city is 978 tons. Based on data from the Gorontalo city Marine Fisheries and Agriculture Office in 2022, the mackerel taken is limited, bearing in mind that the fish is prone to decay and the quality to be achieved is good mackerel quality. Mackerel is a species of marine fish that is generally obtainable and consumed by the general populace because of its affordable price. Considering mackerel is a perishable commodity, one of the treatments is to grind it into a fish meal. According to Ntau et al. (2022), the excellent nutritional value of mackerel flour was discovered in mackerel flour with steaming and pressing of water and oil at 90 °C to generate the optimum nutritional value: water content (%) 3.81; protein (%) 83.37; fat (%) 5.05; carbohydrates (%) 2.85; Calcium (ppm) 83.43; iron (ppm) 14.49.The addition of mackerel flour to biscuit manufacturing, as indicated by Fitri and Purwani (2017), can augment the protein content in biscuits, with 15% mackerel flour producing 11.37 g of protein.

Carrots, a yellowish-orange vegetable known for its high quantities of vitamin A, which is beneficial to eye health, are a popular type of vegetable consumed by the wider public in the form of cooked or salads. Carrots additionally carry Beta-carotene, which can serve as an antidote to cancer-causing free radicals (Lidiyawati et al., 2013). According to the 2017 Indonesian Food Composition Table (TKPI), 100 grams of carrots contain the following nutritional value: water (89.9 g), energy (36 cal), protein (1.0 g), fat (0.6 g), carbohydrates (7.9 g), fiber (1.0 g), calcium (45 mg), phosphorus (74 mg), iron (1.0 mg), beta-carotene (3.784 mcg), total carotene (7.125 mcg), vitamin C (18 mg). According to research, nutritional content of carrot flour water (5.6%), Protein (7.89%) Fat (1.13%) Ash (2.56%) Crude Fiber (7.79%) Carbs (17.63%), Vitamin A (1990 RE) Beta-carotene (11.94mg/g). (Rohman, 2022)

Green spinach is one sort of vegetable high in iron and fiber; is inexpensive, making it accessible to people of all socioeconomic backgrounds. As a result, the product created by the inclusion of spinach is likely to contain high iron (Fe) levels (Yuddhistira, Tepung and Affandi, 2019). Nutritional content according to the Indonesian Ministry of Health for every 100 grams of spinach green is Ash (1.30 g), Water (94.50 g), Beta carotene (pro-vitamin A) (2.69 mcg), Energy (16.00 cal), Phosphorus (76.00 mg), Potassium (456.40 mg), Calcium (166.00 mg), Carbohydrate (2.90 g), Fat (0.40 g), Sodium (16.00 mg), Niacin (1.00 mg), Proteins (0.90 g), Riboflavin (0.10 mg), Fiber (0.70 g), Thiamin (0.04 mg), Vitamin C (41.00 mg), Iron (3.50 mg), Zinc (0.40 mg).

Based on the foregoing, it is necessary to conduct research on the nutritional composition of mackerel fish flour (*Rastrelliger sp.*) wet noodles fortified with vegetable flour, with the goal of producing wet noodles that are not only high in carbohydrates but also contain protein and other nutrients.

METHODS

Mackerel flour wet noodles (*Rastrelliger sp.*) are noodles produced by substituting mackerel fish flour, which is prepared by steaming and pressing fat and water for 5 hours at 80°C. The noodles that result is therefore reinforced with vegetable flour (carrot and green spinach). The nutritional value of carbohydrates, protein, fat, and iron was determined in this study, which was carried out at Laboratorium Penguji Balai Standarisasi dan Pelayanan Jasa Industri Manado. The collected results were statistically processed using the ANOVA test.

Steps for making carrot flour are presented below:

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1) Sorting. A process of selecting goods or things by quality. It is intended to Selecting good quality carrots is judged by its freshness and the health of carrots because of the freshness of carrots affect the aroma, color and texture of carrot flour resulting from.
2) Washing. After the sorting process and produce fresh carrots which is of good quality then the death is washed with water flowing until the dirt that sticks to the carrots comes along wasted.
3) Shredding. The washed carrots are then finely grated to produce carrot granules. This is done to speed up the drying process and make it easier the process of crushing carrots when blended.
4) Drying. The purpose of the drying process is to reduce the water content in carrots using heat energy. Drying can be done in two ways, the first Wash Sorting Carrots Grinding Drying Grating Sieving (100 mesh) Flour Carrot by using an artificial dryer such as spray dryer, tray dryer, drum dryer, oven and the second using a sun dryer or natural drying ie directly in the sun. But method direct drying in the sun it has drawbacks such as difficult to control the temperature and easy Consumed by microbes due to direct exposure to free air. Meanwhile, using a dryer Such modern ovens have advantages such as temperature and air pressure can be adjusted, thereby minimizing insertion of microbes in the process of drying carrots, besides that the drying time as well as the cleanliness of carrot flour remains awake. The results of research on drying carrots with. Tray Dryer with an air drying speed of 1.5m/s conducted by Amiruddin (2013) states that Carrot flour drying process must be heated to a temperature 60 °C then dried again in the oven for 3 hours at 102 °C to reduce the water content in Root so that the desired carrot flour is obtained.
5) Grinding or crushing. The grinding process is carried out after the water content is in Carrots are gone then grinding is done using blender to obtain fine carrot flour.
6) Sieving. It was carried out in such a way that get the same refined carrot flour. Chicken size used is 100 mesh to produce flour finely chopped carrots. Carrot flour used in this study is carrot flour that is ready to use with the brand Products of My Earth merchandise produced by CV Kusuka Ubiku, Yogyakarta Bantul. The source of carrot production comes from the garden Banjarnegara carrot farm with production process in March 2022.

Process of making green spinach flour are as follows: green spinach that has been prepared, plucked the stalks, and leaves then washed using clean water, then dried. Green spinach leaves put in the Kirin (Indonesia) oven and bake at 95ºC with using an aluminum pan for 2 hours. Green spinach leaves that have been dry put into a Philips blender (Netherlands) and blended for ± 2 minutes until the spinach leaves become smooth. Flour that has been formed is filtered by using a filter. (Munira., et all, 2022)

This research is a follow-up study of research conducted by Ayu et al in 2021, namely research on the acceptability test of wet noodles with the addition of pressed and unpressed mackerel flour (Ayu, et all, 2022). For the current research, the difference in treatment is by adding carrot flour and green spinach.

The True Experimental Design Posttest-Only Control Design with a Completely Randomized Design with three treatments and four replications was employed in this study.

Table 1. Products formulation

Substance	piece	F0	F1	F2
Wheat flour	gr	20	20	20
Fish flour	gr	80	80	80
Carrot flour	gr	5	7.5	10
Green spinach flour	gr	5	7.5	10
Egg	item	1	1	1
Salt	gr	5	5	5
Water	ml	50	50	50

RESULTS AND DISCUSSION

Table 2 displays the results of a measurement of the proportions of carbohydrate, protein, fat, and iron (Fe) in mackerel flour wet noodles enriched with vegetable flour.

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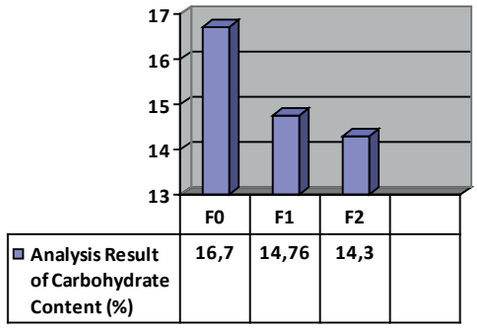
Table 2. Results of Nutrient Level Analysis in Wet Noodles Mackerel Flour Fortified with Vegetable Flour

Analysis Results	Treatments			ANOVA 5%	Tukey HSD 5%
	F0	F1	F2		
Carbohydrate (%)	16,7 [c]	14,76 [b]	14,3 [a]	0,000*	tn
Protein (%)	8,6 1 [a]	8,65 [b]	9,22 [c]	0,000*	tn
Fat (%)	2,62 [b]	2,24 [a]	2,9 [c]	0,000*	tn
Iron (Fe) (mg/kg)	24,20 [b]	22,08 [a]	25,76 [c]	0,000*	tn

Desc.: * = Significantly different in the ANOVA test at the 0.05 level
a,b,c = different notations show significant differences in the LSD test with a level of 0.05
tn = actual difference

The ANOVA test analysis revealed that the quantities of carbohydrate, protein, fat, and iron (Fe) in the three treatments for the preparation of mackerel flour wet noodles enriched with vegetable flour were substantially different. Based on the Tukey HSD follow-up test, carbohydrate, proteins, fat, and iron were substantially different in each treatment, notably wet mackerel flour noodles with 5 grams of fortified vegetable flour, 10 grams of fortified vegetable flour, and 15 grams of fortified veggies. The result obtained based on the advanced Tukey HSD test notation for treatments F0, F1, and F2 differs.

Diagram 1. Carbohydrate Content Analysis of Wet Noodles Mackerel Flour Fortified with Vegetable Flour



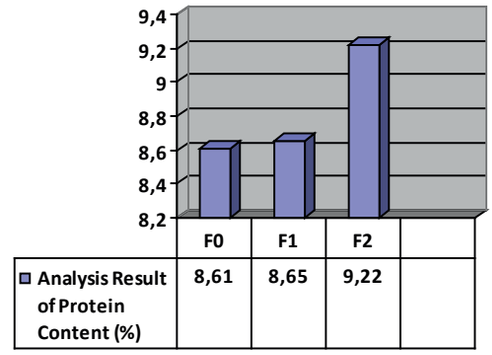
Carbohydrate Content

Diagram 1 depicts the carbohydrate content, which ranges from 14.3% to 16.76%. The carbohydrate content test technique employed was SNI 01-2891-1992 Point 9. The formula with the highest carbohydrate level in the F0 treatment was 16.76%, whereas the formula with the lowest was 14.3% in the F2 therapy. The mackerel flour wet noodles with 10 grams of fortified vegetable flour had the highest carbohydrate level. In contrast, the mackerel flour wet noodles with 20 grams of fortified vegetable flour had the lowest carbohydrate quantity.

The carbohydrate content was reduced after treatment F0 with the addition of 10 grams of vegetable flour, treatment F1 with the addition of 15 grams of vegetable flour, and treatment F2 with the addition of 20 grams of vegetable flour. There is a substantial genuine difference. The more vegetable flour is utilized, the lower the carbohydrate content. This is supported by the ANOVA test findings, which revealed that the carbohydrate analysis values for the three treatments differed significantly.

Furthermore, the vegetable flours utilized, especially spinach flour and carrot flour, include carbohydrates, but the total quantities are lower when compared to wheat flour (Directorate of Community Nutrition, 2018).

Diagram 2. Protein Content Analysis of Mackerel Flour Wet Noodles Fortified with Vegetable Flour



Protein Content

Diagram 2 illustrates protein content values ranging from 8.61% to 9.22%. The SNI 355:2018 Appendix A.4 technique was used to determine

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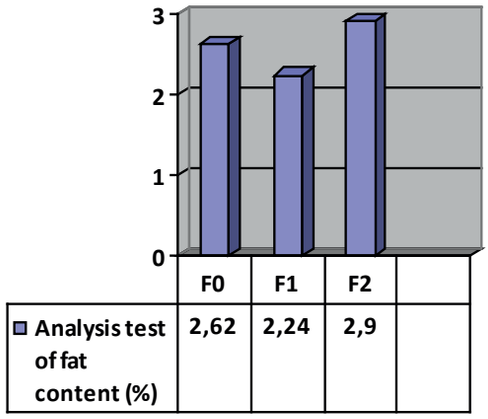
protein content. The protein content of wet mackerel flour enhanced vegetable flour differed significantly in three samples of 10 grams, 15 grams, and 20 grams, according to the ANOVA statistical test. The wet mackerel flour noodle sample fortified with 10 grams of vegetable flour, or the F0 treatment, had the lowest protein content of 8.61%, while the treatment of mackerel wet noodles fortified with 20 grams of vegetable flour, or the F2 treatment, had the highest protein value of 9.22%. This elevation in protein levels is due to the protein content of the vegetables utilized, such as carrots and spinach, which can boost the protein content in mackerel flour wet noodles. In section F2, 10 grams of carrot flour was added which significantly increased the protein content in the noodles. this is because carrots that have been processed into flour produce protein of 7.89% (Rohman, 2022).

Diagram 3. Fat Content Analysis of Mackerel Flour Wet Noodles Fortified with Vegetable Flour



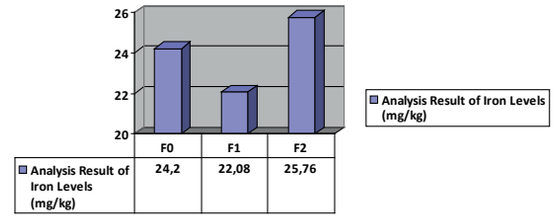
Fat Content

The three treatments' fat contents, which range from 2.24% to 2.9%, are shown in Diagram 3. The test procedure described in SNI 01-2891-1992 point 8.1 is used to determine how much fat is in this wet noodle. The F1 treatment had the lowest value of 2.24% in wet mackerel flour noodles fortified with vegetable flour 15 grams, whereas the F2 treatment had the maximum fat content of 2.9% in wet mackerel flour noodles fortified with vegetable flour up to 20 grams. According to the ANOVA statistical test findings, which reported a significant difference in adding vegetable flour to the three treatments of mackerel flour wet noodles, this proves how fortification of vegetable flour with different magnitudes affects the value of the resulting fat content.

Iron Content

The results of the iron content test using the SNI 01-2896-1998 Point 7 test method for the treatment of puffed flour-enriched wet noodles with vegetable flour ranged from 22.08 mg/kg to 25.76 mg/kg, as shown in diagram 4.4. Wet mackerel flour noodles treated with either the F2 treatment had the maximum iron concentration, measuring 25.76 mg/kg. Whereas the F1 treatment had the lowest iron concentration at 22.08 mg/kg. Wet noodles treated with mackerel flour and reinforced with vegetable flour to a greater extent than the other 2 treatments—up to 20 grams—produced the highest iron concentration.

Diagram 4. Iron Content Analysis of Mackerel Flour Wet Noodles Fortified with Vegetable Flour



Spinach is a vegetable with the most iron or iron content compared to other green vegetables. Spinach flour is produced from spinach leaves that are washed and dried and then ground. because the content of spinach as the most iron, then when made into flour and processed at a concentration of 20 grams can produce the highest iron. This is comparable to the properties of spinach vegetables.

This demonstrates how the iron concentration that results from varying levels of fortification of vegetable flour fluctuates. This was supported by the findings of the ANOVA statistical test, which revealed that the three treatments of mackerel flour wet noodles differed significantly when vegetable flour was included (Salim, *et al*, 2019).

CONCLUSION

The three treatments of fish flour wet noodles with vegetable flour addition had carbohydrate contents ranging from 14.3% to 16.7%, protein

contents range 8.61% to 9.22%, fat content range 2.62 to 2.9%, iron levels ranging from 22.08 mg/kg to 25.76 mg/kg. The ANOVA statistical test findings revealed a significant variation in the amount of vegetable flour added to the mackerel flour wet noodles' carbohydrate, protein and iron content, but not different for fat content base on ANOVA test

REFERENCES

Adisoeganda, A.W. (1996) *Hadisoeganda, A Widjaja. 1996. Bayam Sayuran Penyangga [Spinach Vegetable Support]… - Google Cendekia*. Available at: https://scholar.google.com/scholar?hl=id&as_sdt=0%2C5&q=Hadisoeganda%2C+A+Widjaja.+1996.+Bayam+Sayuran+Penyangga+Petani+Di+Indonesia.+Bandung+%3A+Balai+Penelitian+Tanaman+Sayuran&btnG=#d=gs_md_albl-d&t=1667198423334&u=%2Fcitations%3Fhl%3Did%26xsrf%3DAMD79 (Accessed: 31 October 2022).

Ahmad, H., Mustarin, A. and Fadilah, R. (2020) 'Analisis Kualitas Mie Basah dengan Penambahan Daun Ubi Jalar Ungu (Ipomoea batatas) [Analysis of Quality of Wet Noodles with Sweet Potato Leaves Addition]', *Jurnal Pendidikan Teknologi Pertanian*, 6(1), pp. 87–100. doi:10.26858/JPTP.V6I1.10474.

Badan Pusat Statistik Provinsi Gorontalo (2017) *Potensi Investasi di Provinsi Gorontalo [Investment Potential in Gorontalo Province] - Fachrudin Zain Olilingo - Google Buku*. Available at: https://books.google.co.id/books?hl=id&lr=&id=f8hEDwAAQBAJ&oi=fnd&pg=PA1&dq=Badan+Pusat+Statistik+Provinsi+Gorontalo+(2017)+Produksi+Perikanan+Tangkap+Menurut+Kabupaten/Kota+di+Provinsi+Gorontalo,+2017.+Gorontalo.&ots=uAB1kMYjHF&sig=jpTBWLULHkuk-EDU42C8jTLdDFM&redir_esc=y#v=onepage&q&f=false (Accessed: 31 October 2022).

Direktorat Gizi Masyarakat (2018) *TKPI*. Available at: http://repo.stikesperintis.ac.id/1110/1/32 Tabel Komposisi Pangan Indonesia.pdf (Accessed: 2 November 2022).

Dwi Jayati, R. and Agustina, S. (2018) 'Perbandingan Daya Simpan Dan Uji Organoleptik Mie Basah Dari Berbagai Macam Bahan Alami [Comparison of Storage Power and Organoleptic Tests of Wet Noodles from Various Natural Ingredients]', 1(1), pp. 10–20. doi:10.31540/biosilampari.v1i1.64.

Fatmawati, F. and Mardiana, M. (2014) 'Analisa Tepung Ikan Gabus Sebagai Sumber Protein [Analysis of Snakehead Fish Meal as Protein Source]', *OCTOPUS : JURNAL ILMU PERIKANAN*, 3(1), pp. 236–243. doi:10.26618/OCTOPUS.V3I1.542.

Fitri, N. and Purwani, E. (2017) 'Pengaruh Subsitusi Tepung Ikan Kembung (Rastrelliger brachysoma) Terhadap Kadar Protein dan Daya Terima Biskuit [The Effect of Mackerel Flour Subtitution (Rastrelliger brachysoma) Towards Protein Levels and Biscuits Acceptability]'. Available at: http://publikasiilmiah.ums.ac.id/handle/11617/8692 (Accessed: 2 November 2022).

Hembing (2007) *Hembing: Penyembuhan dengan Wortel [Recuperation with Carrots] - Google Cendekia*. Available at: https://scholar.google.com/scholar?q=related:5jYixvhIhpQJ:scholar.google.com/&scioq=Wijayakusuma,+M.+Hembing.+2007.+Penyembuhan+dengan+Wortel.+Jakarta+:+Yayasan+Pustaka+Obor+Indonesia&hl=id&as_sdt=0,5 (Accessed: 31 October 2022).

Henny Juliastuti dkk (2021) *Sayuran Dan Buah Berwarna Merah, Antioksidan Penangkal Radikal Bebas [Red Vegetables and Fruits, Antioxidant of Free Radicals] - Dr. Henny Juliastuti, dr., M.Kes., Dr. Euis Reni Yuslianti, drg., M.Kes., Iis Inayati Rakhmat, dr., M.Kes., Dewi Ratih Handayani, dr., M.Kes., Adrian Mohammad Prayoga, Fine Nur Ferdian*. Available at: https://books.google.co.id/books?hl=id&lr=&id=vZYoEAAAQBAJ&oi=fnd&pg=PP1&dq=Redaksi+Health+Secret.+2012.+Buku+Keajaiban+Antioksidan+Bayam.+Jakarta+:+PT+Elex+Media+Komputindo&ots=qInejU8IDx&sig=urZ2his4pSKi_VTUaNupExb5AgY&redir_esc=y#v=onepage&q&f=false (Accessed: 3 November 2022).

Husni (2015) 'PENINGKATAN DAYA SIMPAN IKAN KEMBUNG DENGAN EKSTRAK ETANOLIK Padina sp. SELAMA PENYIMPANAN SUHU KAMAR [INCREASING MACKEREL STORABILITY WITH ETHANOLIC EXTRACT DURING STORAGE OF ROOM TEMPERATURE]', *Jurnal Pengolahan Hasil Perikanan Indonesia*, 18(1). doi:10.17844/JPHPI.V18I1.9553.

Indriati, N., Danan Setiawan, I.P. and Yulneriwarni, D. (2006) 'VIII (2) Copyright©2006, Jurnal

Perikanan', *Journal of Fisheries Sciences) All Rights Reserved* [Preprint].

KBMI (2020) *Tim Penerbit KBM Indonesia. 2020. Ensiklopedi Wortel - Google Cendekia*. Available at: https://scholar.google.com/scholar?lookup=0&q=Tim+Penerbit+KBM+Indonesia.+2020.+Ensiklopedi+Wortel&hl=id&as_sdt=0,5&scioq=Jayati,+R.+D.,+Sepriyaningsih,+and+Silvia,+A.+2018.+Perbandingan+Daya+Simpan+dan+Uji+Organoleptik+Mie+Basah+dari+Berbagai+Macam+Bahan (Accessed: 31 October 2022).

KD Arsiti Rahayu A (2016) 'Penambahan Tepung Daun Kelor Dalam Pembuatan Mie Sebagai Sumber Gizi Dengan Penambagan Ekstrak Umbi Wortel Sebagai Bahan Pengawet Alami [The Addition of Moringo Leaves in Noodle Production as a Source Nutrition with Carrot Root Extract Addition as a Narutal Preservative]'.

Koswara, S. (2009) *Seri Teknologi Pangan Populer [Popular Food Technology Series]*.

Lestario, L.N. *et al.* (2010) 'Fortifikasi Mie Dengan Tepung Wortel [Noodle Fortification With Carrot Flour]'. Available at: https://repository.uksw.edu//handle/123456789/6215 (Accessed: 31 October 2022).

Lidiyawati, R. *et al.* (2013) 'Mentel (Permen Wortel) Sebagai Solusi Penambah Vitamin A [Mentel (Carrot Candy) as a Vitamin A Enhancement Solution]', *Jurnal Ilmiah Mahasiswa*, 3(1).

Lisa Rosalina, Agus Suyanto, M.Y. (2018) 'Kadar Protein, Elastisitas , dan Mutu Hedonik Mie Basah dengan Substitusi Tepung Ganyong Protein levels, Elasticity, and Hedonic Quality of Wet Noodle With Substitutes of Canna's Flour[Protein Levels, Elasticity, and Hedonic Quality of Wet Noodles with Canna Flour Substitution Protein levels, Elasticity, and Hedonic Quality of Wet Noodle With Substitutes of Canna's Flour]', *Jurnal Pangan Dan Gizi*, 8(1), pp. 2086–6429.

Litaay, C. and Santoso, D.J. (2013) 'Pengaruh Perbedaan Metode Perendaman dan Lama Perendaman Terhadap Karakteristik Fisiko-Kimia Tepung Ikan Cakalang (Katsuwonus pelamis) [The Effect of Different Soaking Methods and Soaking Time on the Physico-Chemical Characteristics of Skipjack Fish Meal (Katsuwonus pelamis)', *Jurnal Ilmu dan Teknologi Kelautan Tropis*, 5(1), pp. 85–92. Available at: http://itk.fpik.ipb.ac.id/ej_itkt51 (Accessed: 31 October 2022).

Maciej Serda *et al.* (2014) 'Pengaruh Perbedaan Konsentrasi Garam Pada Peda Ikan Kembung (Rastrelliger neglectus) Terhadap Kandungan Asam Glutamat Pemberi Rasa Gurih (umami) [The Effect of Differences in Salt Concentration in Mackerel (Rastrelliger neglectus) on Glutamate Acid Content that Gives Savory Taste (umami)]', *Jurnal Pengolahan dan Bioteknologi Hasil Perikanan*. Edited by G. Balint et al., 3(3), pp. 104–111. doi:10.2/JQUERY.MIN.JS.

Munawwarah (2017) 'Analisis Kandungan Zat Gizi Donat Wortel (Daucus carota L.) Sebagai Alternatif Perbaikan Gizi Masyarakat [Analysis of the Nutritional Content of Carrot Donuts (Daucus carota L.) as an Alternative to Improve Community Nutrition]'.

Munira, Aimannah.U, and Fauziah. (2022), 'Hedonic Scale Of Wafer From Green Spinach (*Amaranthus Hybridus L.*) Flour and Breadfruit (*Artocapus Altilis*). Gorontalo Agriculture Technology Journal. Vol.5 No.2, page : 98.

Nasution, Z., Bakkara, T. and Abstrak, M.M. (2006) 'Pemanfaatan Wortel (Daucus carota) Dalam Pembuatan Mie Basah Serta Analisa Mutu Fisik dan Mutu Gizinya [Utilization of Carrot (Daucus carota) in Wet Noodles Production and Analysis of Physical Quality and Nutritional Quality]', *Jurnal Ilmiah PANNMED*, 1(1).

Ntau, L.A. *et al.* (2022) 'Testing Chemical Properties On Wet Noodles Has Been Suspected With Plush Flour (Rastrelliger sp.)', *Jambura Journal of Health Sciences and Research*, 4(1), pp. 397–405. doi:10.35971/JJHSR.V4I1.11834.

Rara, M.R. *et al.* (2020) 'Sifat Fisik dan Organoleptik Mie Dari Tepung Talas (Colocasia esculenta) Dan Terigu Dengan Penambahan Sari Bayam Merah [Physical and Organoleptic Properties of Noodles from Taro Flour (Colocasia esculenta) and Wheat With Extract Red Spinach Addition]', *Jurnal Teknologi Pertanian (Agricultural Technology Journal*, 10(2). doi:10.35791/JTETA.10.2.2019.29120.

Rohman, N.H. (2022) ' Pengaruh Substitusi Tepung Wortel (Daucus Carota L.) Terhadap Kadar Vitamin A Dan Karakteristik Produk Mie Basah', Universitas Islam Negeri Walisongo Semarang, Hal.20

Safrida, Y.D. *et al.* (2012) 'Isolasi dan karakterisasi bakteri berpotensi probiotik pada ikan kembung (Rastrelliger sp.) [Isolation and characterization of potentially probiotic bacteria in mackerel

(Rastrelliger sp.)]', *Depik*, 1(3), pp. 200–203. doi:10.13170/depik.1.3.124.

Salim, C. *et al.* (2019) ' Pengolahan Tepung Bayam Sebagai Substitusi Tepung Beras Ketan Dalam Pembuatan Klepon'. Jurnal Pariwisata, Vol. 6 No.1, Hal. 56

Sri Mahayani, A.A.P. (2014) 'Pengaruh Penambahan Bayam Terhadap Kualitas Mie Basah [The Effect of Spinach Addition Towards Quality of Wet Noodels]'.

Suyanti (2008) *Buku Membuat Mie Sehat Bergizi & Bebas Pengawet [Guideline Book of Making Healthy Noodles, Nutritious, & Preservative Free] - Penebar Swadaya*. Available at: https://www.penebarswadaya.com/shop/teknologi/pengolahan-pangan/membuat-mie-sehat-bergizi-bebas-pengawet/ (Accessed: 2 November 2022).

Tejasari (2005) *Nilai gizi pangan / oleh, Prof. Dr. Ir. Tejasari, M.Sc. [The nutritional value of food / by. Prof. Dr. Ir. Tejasari, M.Sc.] | OPAC Perpustakaan Nasional RI*. Available at: https://opac.perpusnas.go.id/DetailOpac.aspx?id=1237627 (Accessed: 31 October 2022).

Tirtavani, A.A. dan M. (2017) 'Pengembangan Crackers Dengan Penambahan Tepung Ikan Patin [Pangasius Hypophthalmus] Dan Tepung Wortel [Daucus Carota L.] [Development of Crackers With he Addition of Catfish [Pangasius Hypophthalmus] Meal and [Daucus Carota L.] and Carrot Flour]', *Nutrition and Food Research*, 40(2), pp. 55–62. doi:10.22435/PGM.V40I2.7579.55-62.

Winarno, F.. (2002) *Kimia Pangan dan Gizi [Food Chemistry and Nutrition]*. Jakarta: Gramedia.

Yudhistira, B., Sari, T.R. and Affandi, D.R. (2019) 'Karakteristik Fisik, Kimia dan Organoleptik Cookies Bayam Hijau (Amaranthus tricolor) dengan Penambahan Tomat (Solanum lycopersicum) sebagai Upaya Pemenuhan Defisiensi Zat Besi pada Anak-Anak [Physical, Chemical and Organoleptic Characteristics of Green Spinach Cookies (Amaranthus tricolor) with Tomato (Solanum lycopersicum) Addition as an Effort to Fulfill Iron Deficiency in Children]', *Warta Industri Hasil Pertanian*, 36(2), pp. 83–95. Available at: http://litbang.kemenperin.go.id/ihp/article/view/5286 (Accessed: 2 November 2022).

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ORGANOLEPTIC EVALUATION OF *KEPOK* BANANA HEART (*MUSA PARADISIACA NORMALIS*) NUGGET WITH ADDED CATFISH

Jufri Sineke[1*], Rudolf Boyke Purba[1], Olga Lieke Paruntu[1], Ana B. Montol[1], Nada Sofia Rangka[1]
[1]Health Polytechnic of Manado, Manado

*E-mail: jufrisineke@gmail.com

ABSTRACT

Food is defined as something that can be eaten by humans. In terms of consuming food, it is important to pay attention to the diversity of types of food, so that nutrients can be fulfilled. Banana heart has a very high fiber content. The types of banana buds used in this study were *kepok* banana buds. Catfish contains high nutritional value and used as a source of protein. This study aims to determine the organoleptic evaluation of *kepok* banana heart nuggets with addition of catfish including color, aroma, texture, and taste. The research design was a quasi-experimental experiment with three treatments using a comparison of banana heart *kepok* and catfish meat, as followP1 (banana heart 250 g and catfish 100 g), P2 (banana heart 200 g and catfish 50 g), and P3 (banana heart 150 g fish and catfish 25 gr). The results of the color test showed that the highest results were 100% like to very much like P1 and P2, aroma 100% like to very much like P2 and P3, texture 100% like to very much like P2 and taste 100% like very much like is at P2. The results of the different test analysis showed differences in color, aroma, texture, and taste in the three treatments with a p-value = 0.000. In conclusion, treatment 2 is most preferred formulation by panelists, with a ratio of 200 banana heart and 50 g catfish.

Keywords: banana heart *kepok*, catfish, organoleptic

ABSTRAK

Makanan didefinisikan sebagai sesuatu yang dapat dikonsumsi oleh manusia. Dalam hal mengkonsumsi makanan, penting untuk memperhatikan keragaman jenis makanan agar gizi dapat terpenuhi. Jantung pisang memiliki kandungan serat yang sangat tinggi. Jenis pucuk pisang yang digunakan dalam penelitian ini adalah pucuk pisang kepok. Ikan lele mengandung nilai gizi yang tinggi dan digunakan sebagai sumber protein. Penelitian ini bertujuan untuk mengetahui tingkat kesukaan nugget jantung pisang kepok dengan variasi penambahan daging ikan lele terhadap warna, aroma, tekstur, dan rasa. Rancangan penelitian adalah eksperimen semu dengan tiga perlakuan menggunakan perbandingan jantung pisang kepok dan daging lele, P1 (jantung pisang 250 g dan lele 100 g) P2 (jantung pisang 200 g dan lele 50 g), dan dP3 (jantung pisang 150 gram danikan lele 25 gr). Hasil uji warna menunjukkan bahwa hasil tertinggi adalah 100% suka sangat suka P1 dan P2, aroma 100% suka sangat suka P2 dan P3, tekstur 100% suka sangat suka P2 dan rasa 100% sangat suka. seperti di P2. Hasil analisis uji beda menunjukkan adanya perbedaan warna, aroma, tekstur dan rasa pada ketiga perlakuan dengan nilai p = 0,000. Kesimpulan perlakuan 2 paling disukai panelis, dengan perbandingan 200 jantung pisang dan 50 g lele.

Kata kunci: *lele, jantung pisang kepok, tingkat kesukaan*

INTRODUCTION

Snack food according to the Food and Agricultural Organization (FAO) is food and drink prepared and sold by street vendors on the streets and in other public crowded places which are directly eaten and consumed without further processing or preparation. The term snack food is not far from the terms junk food, fast food and street food because these terms are part of the term snack food (Mavidayanti et al, 2016). Unhealthy eating patterns often occur due to ignorance of the impact and lack of knowledge in choosing snack foods. Knowledge affects attitudes in choosing snacks. Good knowledge is expected to affect the consumption of good food so that it can lead to good nutritional status as well. Lack of knowledge about nutrition and mistakes in choosing snacks will affect nutritional status (Sukma et al, 2014).

The negative aspect of snack food is that if consumed in excess, it can cause obesity. In terms

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of diet, people, especially school children, prefer ready-to-eat foods which generally contain high calories, rich in fat, high in sodium, and low in fiber. This allows cases of overweight or obesity among school-age children (Sukma et al, 2014). Based on data from the World Health Organization (WHO) in 2018, it is known that within a period of 5 years, the increase in the prevalence of snack consumption continues to increase and causes obesity. In 2018, the prevalence of obesity increased to 21%. From overweight to obesity as much as 10.4%, 9.4% remain obese, and only 2.1% overweight to normal. This is because school children often eat snacks that are high in calories and lacking in other nutrients.

Banana heart has health benefits, such as to improve digestion, useful for diet, improve blood circulation, increase the production of red blood cells. Banana heart also contains various nutrients including protein, carbohydrates, minerals, phosphorus, calcium, vitamin B1, vitamin C and the fiber content contained in banana heart is also very high so that banana heart is often touted as a food that contains complete nutrition. The type of banana heart used in this study is the type of *kepok* banana heart, because this *kepok* banana heart has a different taste from other banana hearts, which is more savory and can be processed with various types of processed foods (Astija, 2020). Banana buds, in certain areas, are produced a lot but are not used as food. This is due to the lack of public knowledge about how to manage the banana heart into a food product that has both nutritional value and economic value for the community. Therefore, it is necessary to have other innovations from banana hearts in a more interesting way, one of which is processed into nuggets.

Nugget is one of the fast food that is very popular in Indonesia and is generally liked by everyone, from children to adults. Judging from this, it is very necessary to try to substitute raw materials for nuggets with the addition of ingredients that are rich in nutrients, low in fat, and do not contain cholesterol and are rich in fiber. But here, banana heart only contains 1.2 g/100 g of fresh banana heart (Kemenkes RI, 2018). For this reason, it is necessary to increase the intake of animal protein for the ingredients for making these nuggets, so that catfish meat is added as a source of animal protein because catfish contains high nutritional value and can be used as a source of protein food.

Catfish contains high nutritional value and can be used as a source of protein. Based on the results of proximate analysis conducted by Irwandi (2016), African catfish meat contains 17.7% protein, 4.8% fat, 0.3% carbohydrate, 76% water content, and 1.2% ash/mineral content. Research by Rustaman (2015) in his research states that 141.5 g of processed catfish filet contains vitality of 217 kcal, 26.7 g protein, 11.5 g fat, 20.7 mcg selenium, 4 mcg vitamin B12, potassium 459 mg, and niacin 3.6 mg. The purpose of this study was to determine the level of preference for (color, aroma, texture, and taste) in *Kepok* banana heart nuggets with variations in the addition of catfish meat.

METHODS

The research design was a quasi-experimental with three treatments using a comparison of banana heart and catfish meat, P1 (banana heart 250 g and catfish 100 g), P2 (banana heart 200 g and catfish 50 g), P3 (banana heart 150 g and catfish 25 g). With three treatments using a ratio of banana heart *kepok* and catfish, namely PI banana heart 250: catfish 100, P2 banana heart 200: catfish 50, P3 banana heart 150: catfish 25 with symbols A1, A2, and A3. This research was conducted on April 25, 2022. The study was conducted at the Laboratory of the Department of Nutrition, Poltekkes, the Ministry of Health, Manado, on 30 level 2 nutrition students as moderately trained panelists. Hedonic test with a rating Likert scale that is very much like value = 5, really like value = 4, like = 3, dislike = 2, very dislike = 1.

The data were analyzed univariately to explain or describe the characteristics of each research variable. Bivariate analysis was carried out to see the difference between the three treatments P1, P2 and P3 which was preceded by the normality test of the data,. the data were not normally distributed thus non-parametric test was used, namely the Kruskal Wallis test.

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RESULTS AND DISCUSSION

Tests were carried out on the level of preference for color, aroma, texture, and taste. Test result as follows. Based on the results obtained, the average value given by the panelists to the color of the *kepok* banana heart nugget with variations in the addition of catfish meat, the highest results obtained from 100% liking to very much liking were in P1 and P2.

Table 1. Results of color evaluation of nugget

Levels of Liking	Color		
	P1	P2	P3
	%	%	%
Very Dislike	0.0	0.0	0.0
Dislike	0.0	0.0	50.0
Like	6.7	66.7	40.0
Really like	33.3	27.7	6,7
Very Much Like	60.0	6.7	3.3
Total	100	100	100

The results of the assessment obtained can be seen that the average value given by the panelists to the aroma of the *kepok* banana heart nugget with variations in the addition of catfish meat, namely the highest results from 100% liking to very much liking was P2 and P3.

Table 2. Results of aroma evaluation of nugget

Levels of Liking	Aroma		
	P1	P2	P3
	%	%	%
Very Dislike	0	0	0
Dislike	3.3	0	0
Like	63.3	3.3	70.0
Really like	26.7	36.7	23.3
Very Much Like	6.7	60.0	6.7
Total	100	100	100

The results obtained can be seen that the average value given by the panelists to the texture of the *kepok* banana heart nugget with variations in the addition of catfish meat, the highest results obtained are 100% in P2 with the category of sports to very, very like.

Table 3. Results of texture evaluation of nugget

Levels of Liking	Texture		
	P1	P2	P3
	%	%	%
Very Dislike	0	0	0
Dislike	46.7	0	6.7
Like	33.3	13.3	73.3
Really like	10.0	26.7	13.3
Very Much Like	10.0	60.0	6.7
Total	100	100	100

Based on the results of the assessment, it was found that the average value given by the panelists to the taste of the *kepok* banana heart nuggets with variations in the addition of catfish meat, the highest result of 100% liking to very much liking was at P2.

Table 4. Results of taste evaluation of nugget

Levels of Liking	Taste		
	P1	P2	P3
	%	%	%
Very Dislike	0	0	0
Dislike	3.3	0	36.7
Like	63.3	26.7	53.3
Really like	20.0	16.7	10.0
Very Much Like	13.3	56.7	0
Total	100	100	100

The results of the Kruskal Wallis test with a significant level of of 0.05. Based on the results of statistical analysis obtained p value of 0.000 <0.05 so that it can be stated that there are differences in color, aroma, texture, and taste of the three treatments of *kepok* banana heart nugget with variations in the addition of catfish meat. To find out the significant differences between the three treatments, a post hoc test was conducted. Based on the results obtained, it can be seen that the highest value of 71.27 is found in P2. Based on allthree treatments, the most preferred treatment was treatment 2, namely the ratio of 200 g of *Kepok* Banana Heart to 50 g of catfish meat.

Color is an indicator of freshness or maturity of a product. Color is one of the basic criteria for determining food quality and

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guidanceabout chemical changes in food. This parameter will be assessed by the senses of the eye. Color is the biggest attraction for enjoying the aroma of food. Color in food can increase consumer acceptance of a product (Sumarlin, 2010).

In this study, the panelists preferred treatment 1 and treatment 2. This was due to the creamy white nugget product. This color appears when the material is heated, the white dough changes color to cream. This means that the more banana hearts are added, the creamier the color of the nuggets will be. This color is produced due to a non-enzymatic browning reaction according to Yunita et al (2015) in their research on the manufacture of shredded bananas and fish, it showed that the color of the shredded was very influential with the addition of more banana hearts and the more addition of banana hearts, the darker the color of the shredded will be. According to Wattimena, et al (2013) in their research on the manufacture of meatballs from banana heart, the more addition of banana heart will produce meatballs with darker color, because banana heart contains phenolic compounds which give the effect of brown color mixed with meat. Then the addition of flour as a binder which results in the gelatinization process during cooking. Based on the results of the Kruskal Wallis test analysis showed that there was a difference in the color of the *Kepok* banana heart nugget with variations in the addition of catfish meat.

Aroma is a component that participates in supporting consumer interest in a food product. Scents can be detected by the sense of smell. The aroma of a food product is able to invite consumer interest to buy or taste a processed food product.

In this study, the panelists preferred treatment 2. Basically, the banana heart has a sepat smell that comes from the sap in the banana heart, but with the boiled processing process it will remove the bad smell and remove the sap on the banana heart. The aroma of banana heart nuggets and catfish is typical of the combination of banana heart and catfish. So, the more banana blossoms are added, the more different the aroma of the nuggets will be. The aroma of fish in the nuggets is also influenced by the banana heart and other ingredients, the higher the addition of the banana heart, the more the aroma of fish meat will be lost (Sudiono, 2017). Based on the results of the analysis of the Kruskal Wallis test, it showed that there was a difference in the aroma of the *Kepok* banana heart nugget with variations in the addition of catfish meat.

Food texture is also a component that determines the taste of a food. Food texture has an important role in influencing a person's acceptance of food. In this study, the panelists preferred treatment 2. In this study, the three treatments produced different textures. The texture produced with a lot of banana heart will produce soft nuggets due to the high water content in the banana heart, which is 83.87% (Pradana, 2012). In Sudiono's research, (2017) in the manufacture of jelawat fish balls with the addition of *kepok* banana hearts, it shows that the meatballs produced with the addition of high banana hearts affect the texture of the meatballs because the meatballs produced have a dense and compact texture. Based on the results of the Kruskal Wallis test analysis showed that there was a difference in the texture of the *Kepok* banana heart nugget with variations in the addition of catfish meat.

Taste is the most important part in terms of the taste of a food product that can attract someone and can create an impression of processed food products. Taste can be felt by the sense of taste (Cahyadi, 2012). In this study, the panelists preferred treatment 2. This was because the taste in treatment 2 was not too much and also not too little banana heart and not too much or too little addition of catfish so that it tasted good. According to Putri (2015) in her research on the raw material for making beef jerky, banana heart has tannin so that the resulting taste is astringent and slightly bitter, so the more addition of banana heart will affect the taste of the product being processed. Based on the results of the Kruskal Wallis test analysis showed that there was a difference in the taste of the *Kepok* banana heart nugget with variations in the addition of catfish meat.

CONCLUSION

There is a difference between the level of preference for the color, aroma, texture, and taste of *kepok* banana heart nuggets with variations in the addition of catfish meat in treatment 1, treatment

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2, and treatment 3 with p = 0.000 <0.05. There are differences between the three treatments of *kepok* banana heart nuggets with variations in the addition of catfish meat. Of that three existing treatments, the most preferred treatment was treatment 2 based on color, aromam and texture. Further research needs to be done in order to produce nuggets with better quality and acceptability.

REFERENCES

Aprilia, A. (2018). Obesity in Elementary School Children. Journal of Health. Faculty of Medicine, University of Lampung Vol. 4, No. 10.

Astija, D. (2020). Analysis of fat content in abon made from banana heart (Musa paradisiaca) and eel (Anguilla marmorata). Journal Of Nutrition College, 241-246.

Drug and Food Control Agency (BPOM). Number 31. (2018). Definition of Food.

Cahyadi, W. (2012). Soybean Benefits and Technology. Jakarta : PT. Earth Literature. 95 p.m.

Food and Agricultural Organization (FAO). 2015. Foods and Nutrition in School.

Irwandi. (2016). Proximate Analysis of Smoked Dumbo Catfish (Clarias gariepinus) (Case Study at Fish Processing Unit CV. Family Pisces Farm, Pasie Kandang, Koto Tangah, Padang City, West Sumatra), UNES Journal of Scientech Research, vol. 1, no. 2, pp. 1-10, 2016.

Ministry of Health, RI. 2018. Table of Indonesian Food Composition (2017) The nutritional composition of 100 grams of fresh *kepok* banana heart. Ministry of Health RI Directorate General of Public Health.

Mavidayanti, H & Mardiana. (2016). School Policy in the Selection of Snacks for Elementary School Children. Journal of Health Education. ISSN 2527-4252.

Pradana, E. (2012). Evaluation of the Quality of Banana and Catfish Hearts as Fiber-rich Foods. Thesis Department of Agricultural Technology. Faculty of Agriculture. Riau University. Pekanbaru.

Putri, A, R. (2015). Characteristics of *Kepok* Banana Heart Jerky (Musa Paradisiaca) with Addition of Catfish (Pangasius sp) and Tofu Dregs, Article. Bandung.

Rustaman. (2015). Favorite Fish Catfish. Son of Pure Trust. Jakarta.

Sudiono, N. (2017). Study of Consumer Acceptance of Jelawatan Fish Meatballs (Leptobarbus hoevenii) with the Addition of *Kepok* Banana Heart Flour (Musa Paradisiaca). Journal. Faculty of Fisheries and Marine Affairs, Riau University, Pekanbaru.

Sukma, D, C & Margawati, A. (2014). Relationship between Knowledge and Attitude in Choosing Snack Foods with Obesity in Adolescents at SMP Negeri 2 Brebes. Journal Of Nutrition College, Vol. 3, No. 4, 2014

Sumarlin. (2010). Identification of Synthetic Dyes in Food Products Circulating in Jarakta and Ciputat. Journal of Valence 1, No.6, May 2010.

Tarigan, & Karina, R. (2017). Utilization of *kepok* banana heart in making nuggets, acceptability and nutritional value. Public Health.

Wattimena, m. Bintoro, V, P & Mulyani, S. (2013). Quality Meatballs Made from Chicken and Banana Hearts with Sago Flour Binder. Food Technology Applications, Vol. 2. No. 1.

World Health Organization (2018). Obesity and overweight. World Health Organization. http://www.who.int/en/news-room/fact-sheets/detail/obesity-and-overweight - Accessed September 2018

Yunita, E, P. Putri, Y, S & Hardoko. (2015). Banana Heart Substitution in Making Shredded From Pindang Tuna. Journal of Fisheries and Marine Affairs. Vol 20, No 1. Faculty of Fisheries and Maritime Affairs, University of Riau.

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CHARACTERISTICS OF TUNA SAUSAGE WITH THE ADDITION OF YELLOW PUMPKIN FLOUR AS A SOURCE OF PROTEIN AND VITAMIN A IN COVID-19 PANDEMIC

Mutia Reski Amalia[1*], Maya Kumalasari Sugiyanto[1], Pepi Sugianto Umar[1], Novian Swasono Hadi[1]
[1]Nutrition Department, Health Polytechnic of Gorontalo
*E-mail: mutiaamalia@poltekkesgorontalo.ac.id

ABSTRACT

Enhancing immunity is crucial against COVID-19, achieved through improved nutrition, especially protein and vitamin A. Protein aids in antibody production, which is vital for infection defence. Malnourished children have weakened immunity due to inadequate antibody formation, leading to higher mortality rates. Vitamin A also bolsters immunity. This study focused on tuna sausages enriched with pumpkin flour to enhance nutritional value and visual appeal. The aim was to boost agricultural and fisheries productivity for food security during the pandemic, offering a healthy, cost-effective protein and vitamin A source from local resources. The study assessed the characteristics of these sausages through a randomized design with three formulations: 10%, 20%, and 30% pumpkin flour. Nutritional analysis was conducted using the proximate method. Results favoured the second formula, showing significant differences in taste, colour, and texture. The third formula had the highest protein content, while the second one excelled in fat and vitamin A.

Keywords: sausage, tuna, yellow pumpkin

ABSTRAK

Meningkatkan imunitas sangat penting dalam melawan COVID-19, dapat dicapai melalui peningkatan asupan nutrisi, terutama protein dan vitamin A. Protein membantu produksi antibodi yang sangat penting dalam pertahanan tubuh terhadap infeksi. Anak-anak yang mengalami malnutrisi memiliki sistem kekebalan tubuh yang lemah karena produksi antibodi yang tidak memadai, yang dapat mengakibatkan tingginya tingkat kematian. Vitamin A juga mendukung kekebalan tubuh. Studi ini berfokus pada sosis tuna yang diperkaya dengan tepung labu untuk meningkatkan nilai gizi dan daya tarik visual. Tujuan penelitian ini adalah untuk meningkatkan produktivitas pertanian dan perikanan guna menjaga ketahanan pangan selama pandemi, dengan menawarkan sumber protein dan vitamin A yang sehat dan ekonomis dari sumber daya lokal. Studi ini mengevaluasi karakteristik sosis melalui desain acak dengan tiga formulasi: 10%, 20%, dan 30% tepung labu. Analisis gizi dilakukan menggunakan metode proksimat. Hasilnya lebih mendukung formula kedua, menunjukkan perbedaan signifikan dalam rasa, warna, dan tekstur di antara ketiganya. Formula ketiga memiliki kandungan protein tertinggi, sementara formula kedua unggul dalam kandungan lemak dan vitamin A.

Kata kunci: *sosis, tuna, labu kuning*

INTRODUCTION

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered corona virus that requires people to take preventive measures by changing habits. During the Covid-19 pandemic, people did a lot of activities from home (Saragih and Saragih, 2020) Higher consumption of processed foods with higher calorie content, high in saturated fat, sugar, refined carbohydrates, easier access and use, may contribute to increasing the prevalence of obesity during the time of COVID-19 (Rambing *et al.* , 2021) . Improving immunity is one of the countermeasures for COVID-19 disease, one of which is by increasing nutritional intake. One of the nutrients needed to increase immunity is protein and vitamin A. Protein is crucial to form antibodies which will later fight infection. The high mortality rate in children who suffer from malnutrition is mostly caused by decreased immunity against infection due to their inability to form antibodies in sufficient quantities. Vitamin A is also one of the vitamins that play a role in boosting immunity. A strong association has

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been found between vitamin A status and risk of respiratory infections (Almatsier, 2004) .

One source of animal protein that is widely consumed by the public, easy to obtain at a low price is fish. Fish cannot be stored for a long time because it quickly undergoes a process of decay. Therefore, it is necessary to process fish so that it is stored longer and lasts longer. One effort to diversify fishery products is fish sausage (Ramasari, Ma'ruf and Riyadi, 2012) .

One of the fisheries products that has the potential to be developed is tuna. Based on data from the Ministry of Maritime Affairs and Fisheries for 2020, the total catch of tuna in Indonesia has reached 69 thousand tons. Gorontalo Province is the province with the highest amount of tuna caught, reaching ten thousand tons (MMAF, 2020) .

Sausages are generally made of ground meat, mashed, seasoned, put in *casings* and smoked with or without cooking (Verly Dotulong, 2009) . The addition of pumpkin flour which is a source of vitamin A is expected to increase the nutritional value of sausages. The addition of pumpkin flour to meat sausages has been shown to increase β-carotene levels in beef sausages (Prayitno *et al.* , 2009) .

The development of tuna sausages has been carried out by utilizing the fermentation method or using the red meat of tuna (Suhendar, 2003; Ikasari, Syamdidi and Suryaningrum, 2011; Nursam, 2011; Yuwana, 2018). The sausages in this study were sausages made from tuna with the addition of pumpkin flour so that it was expected to increase the nutritional content and attractive color of the sausages. The selection of this product aims to increase the productivity of agriculture and fisheries in order to realize food security in the framework of national security. In addition to developing healthy, economical, and nutritious sausages as a source of protein and vitamin A made from local food during the Covid-19 pandemic.

METHODS

The research design used a completely randomized design with three different treatments of tuna sausage formulations with the addition of 10% pumpkin flour; 20%; and 30%. Nutritional value using the proximate method. Stages study started with making flour pumpkin yellow then making sausage. Stages next is a power test accept and analyze proximate and Vitamin A levels. The research data were processed statistically for the ANOVA (Analysis of Variance) test of diversity and continued with the BNT test (Dahlan, 2013.)

Sausage development consists of several stages, namely preparation of ingredients, mixing of ingredients, insertion into sausage casings, steaming, cooling and storage. The pumpkin tuna sausage was then tested for its acceptability and nutritional value was analyzed using the proximate test. Parameters observed in this study were acceptability (color, aroma, taste, and texture), analysis of nutrients (protein content, fat content, ash content, carbohydrate content, and vitamin A).

RESULTS AND DISCUSSIONS

Acceptability includes aroma, color, taste, and texture with 30 panelists. The average score of the acceptability test or organoleptic test can be seen in Table 1. Aroma is one of them nature sensory received by the senses the smeller could influence level reception sensory. Duncan's further test results show that sausage tuna squash does raises evaluation that scent different in a manner significant. Similar results were also found for the product *muffins,* analog rice, noodles and sausages added meat with flour pumpkin yellow with addition flour pumpkin yellow (Rismaya, Syamsir and Nurtama, 2018 ; Pramono *et al.* , 2021; Novita Indrianti, Sholichah and Afifah, 2021; Hleap-Zapata *et al.* , 2020) . Color is a main factor considered in development product, because panelist evaluate product first time sighting the visual. kindly general, increase concentration flour pumpkin added yellow cause decline reception sensory color. Addition flour pumpkin yellow have evaluation sensory low color consequence that color too dark (Rismaya, Syamsir and Nurtama, 2018) . These results were also shown in tuna sausage with addition flour pumpkin yellow. The more many additions flour the pumpkin, the more decreased level favorite from facet color. Yellow browning color of added product flour pumpkin yellow suspected caused by existence beta carotene

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Table 1. Preference test results

Component	Formulas		
	F1	F2	F3
Flavor*	3.80 ± 0.8[a]	3.93 ±0.98 [b]	3.00 ± 1.23 [c]
Color *	3.97 ±0.77 [a]	3.93 ± 0.87 [b]	3.30 ± 1.08 [c] _
Texture *	3.67 ± 0.75 [a]	4.03 ± 0.61 [b]	3.43 ± 1.13 [c]
Aroma	3.23 ± 1.19	3.60 ± 1.19	3.33 ± 1.18

Table 2. Nutritional value of sausages (per 100g)

Component	Formulas		
	F1	F2	F3
Water (%)	66.6 ± 0.15	66.54 ± 0.14	66.16 ± 0.15
Ash (%)	1.69 ± 0.14	1.82 ± 0.0 9	1.66 ± 0.48
Fat (%)	0.44 ±0.0 07 [a]	0.94 ±0.0 6 [b]	0.86 ±0.0 5 [b]
Proteins (%)	14.30 ± 0.01 [a]	14.35 ± 0.44 [a]	17.03 ± 0.24 [b]
KH (%)	16.97 ± 0.15 [a]	16.55 ± 0.89 [b]	14.28 ± 0.05 [b]
Vitamin A (µg/100g)	137.87 ± 7.21 [a]	293.73 ± 78.31 [b]	258.07 ± 102.12 [b]

Data presented in mean ± standard form deviation
Same letters in the same column show no significant difference (p>0.05)

content in flour pumpkin yellow (Rasyid *et al.* , 2020) .

Based on the results of the preference test seen that the second formula to be the formula with the most preferred taste, texture and aroma. Tuna Pumpkin Sausage with the first formula is the most preferred color.

Sausage water content tuna squash ranged from 66.16-11.6% and content ash ranged from 1.66-1.69% (table 2). The low water activity provided by the flour pumpkin yellow show stability excellent storage, because almost all contributing reactions to damage food delayed or entirely stopped when food water activity reduce (Pereira *et al.* , 2020) .

Statistically, water content and content ash no show difference significant between three sausage formulas tuna squash (p>0.05). The levels of fat, protein, carbohydrates and vitamin A show difference significant from difference formulation flour pumpkin and smoked roa fish based on a two-way ANOVA test (p<0.05).

Protein content of sausage with addition pumpkin yellow presented in Table 2. Research results show that protein content of sausage with addition pumpkin yellow was significantly different (P<0.05). A number minerals, vitamins, carotenoids , and substances bioactive others, as well activity promotion documented health, making flour pumpkin as ingredient addition interesting food (Poliszko *et al.* , 2019) . Protein contents was ranged between 14.30% to 17.03%. The more yellow pumpkins added, protein levels is increased. Results was like sausages meat fortified beef _ with β -carotene from pumpkin yellow show that the higher level of flour filler substitution pumpkin yellow the more increase score sausage protein content. This caused because flour protein content pumpkin yellow more tall compared flour tapioca. Flour protein content pumpkin yellow that is about 5%, meanwhile flour protein content tapioca that is around 0.5 to 0.7% (Prayitno *et al.* , 2009) . Enhancement Vitamin A levels are seen in sausages tuna squash. Change Vitamin A levels are also seen in addition flour pumpkin on spongecake (Ghaboos and Ardabili, 2018) .

A study that discusses people's consumption of processed food during the Covid-19 Pandemic, especially the consumption of processed food in the form of grains, fruits, meat and fish, vegetables, milk, and ready-to-eat processed foods. The results showed that processed meat and fish that were consumed the most were sausages because they could be eaten immediately, were filling, easy to find, and liked by various groups, both children and adults (Kamelia, Supriyadi and Afif, 2021). Pumpkin tuna sausage products can be used as a

healthy solution for processed foods as a source of protein.

CONCLUSION

Sausage tuna squash has opportunity to be developed as processing which food contains protein and vitamin A as one form processed side dish which is useful in improving nutritional intake and immunity. Further research could be done in evaluating storage time of developed sausage.

REFERENCES

Almatsier, S. (2004) *Basic Principles of Nutrition Science* . Jakarta: PT. Main Library Gramedia.

Ghaboos, H. and Ardabili, S. (2018) 'Physico-chemical , textural and sensory evaluation of sponge cake supplemented with pumpkin flour', 25(April), pp. 854–860.

Hleap-Zapata, JI *et al.* (2020) 'Evaluation of pumpkin flour (Cucurbita moschata duch.) added as a meat extender in Frankfurt-type sausages', *Revista de la Facultad de Ciencias Agrarias* , 52(2), pp. 395–404.

Ikasari, D., Syamdidi, S. and Suryaningrum, T. D. (2011) 'Penggunaan bakteri asam laktat dan lemak sapi dalam pengolahan limbah tuna menjadi sosis fermentasi', *Jurnal Pascapanen dan Bioteknologi Kelautan dan Perikanan*, 6(2), pp. 101–110. Available at: http://bbp4b.litbang.kkp.go.id/jurnal-jpbkp/index.php/jpbkp/article/view/402 (Accessed: 9 May 2023).

Kamelia, M., Supriyadi and Afif, D. N. Y. (2021) 'Gambaran konsumsi makanan olahan masyarakat pada masa pandemi covid-19', Prosiding Penelitian Dan Pengabdian 2021, pp. 1237–1247.

MMAF (2020) *Fishery Production* , *Ministry of Maritime Affairs and Fisheries* . Available at: statistic.kkp.go.id.

Novita Indrianti, N., Sholichah, E. and Afifah, N. (2021) 'Pumpkin flour effects on antioxidant activity, texture, and sensory attributes of flat tubers noodle', *IOP Conference Series: Materials Science and Engineering* , 1011(1) . doi: 10.1088/1757-899X/1011/1/012007.

Nursam, H. (2011) 'Pengolahan sosis fermentasi ikan tuna (Thunnus sp.) menggunakan kultur starter Lactobacillus plantarum terhadap nilai pH, total asam, N-total, dan N-amino.', *Jurnal Ilmiah Perikanan dan Kelautan*, 3(2). Available at: http://download.garuda.kemdikbud.go.id/article.php?article=1038688&val=7418&title=Pengolahan Sosis Fermentasi Ikan Tuna Thunnus abacares Menggunakan Kultur Starter Lactobacillus plantarum Terhadap Nilai Ph Total Asam N-Total dan Namino Tuna Fish Thunnus albacares Fermented Sausage Processing Using Lactobacillus plantarum Starter Culture Against Ph Total Acid N-Total And N-Amino (Accessed: 9 May 2023).

Pereira, AM *et al.* (2020) 'Physicochemical characterization, carotenoid content and protein digestibility of pumpkin access flours for food application', *Food Science and Technology (Brazil)* , 40(December), pp. 691–698. doi: 10.1590/fst.38819.

Poliszko, N. *et al.* (2019) 'The effect of pumpkin flour on the quality and acoustic properties of extruded corn snacks', *Journal fur Verbraucherschutz und Lebensmittelsicherheit* , 14(2), pp. 121–129. doi: 10.1007/s00003-019-01216-6.

Pramono, YB *et al.* (2021) 'Physical, chemical, stickiness and organoleptic characteristics of analog white sweet potato rice with the addition of pumpkin flour', *IOP Conference Series: Earth and Environmental Science* , 803(1). doi: 10.1088/1755-1315/803/1/012039.

Prayitno, AH *et al.* (2009) 'Characteristics of B-Carotene Fortified Sausage from Yellow Pumpkin (Curcubita Moschata)', *Livestock Bulletin* , 33(2), pp. 111–118.

Ramasari, E., Ma'ruf, W. and Riyadi, P. (2012) 'APPLICATION OF CARGENANAN AS AN EMULSIFIER IN THE MANUFACTURE OF MACHINERY (Scomberomorus guttatus) SAUSAGE AT ROOM TEMPERATURE STORAGE', *Journal of Fishery Products Processing and Biotechnology* , 1(1)), pp. 1–8.

Rambing, CJE *et al.* (2021) 'Energy Intake and Nutritional Status of Students During the COVID-19 Pandemic', *Journal of Biomedicine* , 13(2), pp. 175–179. doi: 10.35790/jbm.13.2.2021.31776.

Rasyid, MI *et al.* (2020) 'Sensory Characteristics of Mocaf Cookies with Pumpkin Flour Substitution', *Journal of Agricultural Processing Technology* , 2(1), pp. 1–7. Available at: http://jurnal.utu.ac.id/jtpp/article/view/2043.

Rismaya, R., Syamsir, E. and Nurtama, B. (2018) 'EFFECT OF ADDITION OF YELLOW PUMPKIN FLOUR ON FOOD FIBER, PHYSICOCHEMICAL CHARACTERISTICS AND SENSORY OF MUFFIN [The Effects

of Pumpkin Flour Addition on the Dietary Fiber Content, Physicochemical and Sensory Characteristics of Muffins]', 29(1), pp. 58–68. doi: 10.6066/jtip.2018.29.1.58.

Saragih, OB and Saragih, FM (2020) *DESCRIPTION of Community Food Habits in the Covid-19 Pandemic Period)* , *researchgate.net* . Available at: https://www.researchgate.net/profile/Bernatal_Saragih/publication/340830940_GAMBARAN_KEBI ASAAN_MAKAN_MASYARAKAT_PADA_MASA_PANDEMI_COVID-19_Description_of_Community_Food_Habits_in_the_Covid-19_Pandemic_Period/links/5ea032d3a6fdcc01dee6acc4/GAMBARAN-KEBIASA (Accessed: 20 May 2021).

Suhendar, E. (2003) 'Pemanfaatan Daging Merah Ikan Tuna.(Thunnus albacores) sebagai Produk Sosis (Frankfurter).' Available at: https://agris.fao.org/agris-search/search.do?recordID=ID2021104228 (Accessed: 9 May 2023).

Verly Dotulong (2009) 'PROXIMATE VALUE OF YELLOW-tail FISH (Caesio spp) Sausage BASED ON CASE TYPE AND STORAGE - UNSRAT Repository', *Pacific Journal* , 1(4), pp. 506–509. Available at: http://repo.unsrat.ac.id/291/ (Accessed: 21 May 2021).

Yuwana, A. (2018) Pengaruh Lama Penyimpanan Terhadap Kualitas Sosis Ikan Tuna (Thunnus Albacares) Asap Yang Di Fermentasi Dengan Bakteri Lactobacillus Casei. Universitas Brawijay. Available at: http://repository.ub.ac.id/11269/3/BAGIAN DEPAN.pdf (Accessed: 9 May 2023).

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THE EFFECT OF SUBSTITUTION OF SNAKEHEAD FISH AND PURPLE EGGPLANT FLOUR ON THE ACCEPTABILITY OF BISCUITS FOR STUNTING PREVENTION

Misnati[1*], Anna Y Pomalingo[1], Irza Nanda Ranti[2], Nuryani[1]
[1]Nutrition Departement, Health Polytecnic of Gorontalo, Gorontalo, Indonesia
[2]Nutrition Departement, Health Polytecnic of Manado, Manado, Indonesia
*E-mail: misnatigizi@gmail.com

ABSTRACT

The development of supplementary food formulas for toddlers made from local foods can be an alternative in handling child nutritional problems. Purpose of study was to observe the acceptability of biscuits substitution of snakehead fish meal and purple eggplant flour. Design of study was an quasi experimental using *postest only control group design* with four treatments namely substitution of snakehead fish meal and purple eggplant flour. The ratio of wheat flour, fish meal and purple eggplant flour is 100%: 0 : 0,85% : 10% : 5%, 70% : 20% : 10%, and 55% : 30% : 15%. The results of the study based in the color characteristic the highest score after control was F1 (score = 2.47), the taste aspect F1 (score = 2.7), the aroma aspect F1 (score = 2.41), thetexture/crunch F1 (score = 2.65). There was an effect of substitution of snakehead fish meal and purple eggplant flour on color acceptability (p = 0.000) and taste (p = 0.003), there is no effect of substitution of snakehead fish meal and purple eggplant flour on aroma receptivity (p = 0.306) and crispness (*p* = 0.155). In conclusion, there are significant differences in the color and taste characteristics of cookies substitution of snakehead fish flour and purple eggplant flour between F0, F1, F2 and F3.

Keywords: biscuits, snakehead fish, eggplant purple, color, taste

ABSTRAK

Pengembangan formula makanan tambahan untuk balita berbahan pangan lokal dapat menjadi alternatif dalam penanganan masalah gizi balita. Tujuan penelitian untuk mengetahui daya terima biscuit subtitusi tepung ikan gabus dan tepung terong ungu. Desain penelitian adalah eksperimental semu (quasi experiment) menggunakan rancangan postest only control group design dengan empat perlakuan yaitu subtitusi tepung ikan gabus dan tepung terong ungu. Perbandingan tepung terigu, tepung ikan dan tepung terong ungu adalah 100% : 0 : 0, 85% : 10% : 5%, 70% : 20% : 10%, dan 55% : 30% : 15%. Hasil penelitian menunjukkan pada karakterisitk warna skor paling tinggi setelah kontrol adalah F1 (skor = 2,41), aspek rasa F1 (skor = 2,47), aspek aroma F1 (skor = 2,41), aspek kerenyahan F1 (skor = 2,65). Ada pengaruh subtitusi tepung ikan gabus dan tepung terong ungu terhadap daya terima warna (p = 0,000) dan rasa (p = 0,003), tidak ada pengaruh subtitusi tepung ikan gabus dan tepung terong ungu terhadap daya terima aroma (p = 0,306) dan kerenyahan (p = 0,155). Kesimpulan menunjukkan terdapat perbedaan signifikan karakteristik warna dan rasa cookies subtitusi tepung gabuns dan tepung terong ungu pada F0, F1, F2, F3.

Kata kunci: *biscuit, ikan gabus, terong ungu, warna, rasa*

INTRODUCTION

Toddlerhood is a golden period of growth and development. Failure in this period is irreparable in the next phase of life and will affect health outcomes in childhood and adulthood. Malnutrition that occurs at the beginning of life can result in growth faltering which affects cognitive development, morbidity, and mortality. Optimal growth and development requires proper and adequate nutritional intake, parenting, and stimulus (Marlina, Maulianti, and Fernandez 2018).

Based on National Health Survey in 2018, nationally, the prevalence of malnutrition in children under five is 17.7 percent which is still a serious health problem. Stunting toddlers is also still a serious problem in Indonesia with a prevalence of 29.9%(Ministry of Health 2018). Base on data from Nutritional Status Indonesia Survey (SSGI) shows that prevalence of stunting in

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toddler 29.0% in Gorontalo and 24.4% in national level (Ministry of Health 2021).

Nutritional problems that occur in toddlers occur due to unbalanced intake of food consumed. Total Diet Survey in 2014 found that the average level of macro and micronutrient adequacy in toddlers was still lacking in some parts of Indonesia (Ministry of Health, 2016). To overcome this problems, developing an additional food formula for toddlers made from local food that can meet the nutritional needs of both macro and micronutrients in the form of making biscuits substituted with snakehead fish meal and purple eggplant .

Biscuits are a type of pastry that is widely consumed by people from all walks of life. Biscuit is a dry bakery product made by baking dough made from wheat flour with or without its substitution, oil/fat, with or without the addition of other foodstuffs and permitted food additives (BSN 2011). Biscuits can be used as an alternative to practical and healthy interlude foods. The raw material for making biscuits is wheat flour derived from wheat where itself cannot be grown in Indonesia, so one solution to the problem is by importing. For this reason, the use of alternative flour is an option, including snakehead fish meal and purple eggplant flour.

Fish is a fishery product that contains the main nutrients in the form of protein, fat, vitamins and minerals. Fish as an animal food has several advantages over other protein sources, including a fairly high protein content in the fish body composed of amino acids that are patterned close to the needs of amino acids in the human body, fish meat contains unsaturated fatty acids needed by the human body. One of the fish with the best nutritional content is snakehead fish, which is freshwater fish that contains the best protein that is very beneficial for health such as increasing endurance, healing wounds, maintaining cell fluid balance, and healing and preventing diseases (Dahlia et al. 2019). Snakehead extract contains abundant of albumin (2.17 ± 0.14g/100mL) which is the largest fraction (64.61%) of protein. This is sufficient to provide albumin for highly demanded such as hypoalbuminemia and post-surgicalpatients, and growing children. Snakehead extract is a potential source of albumin as per 100 mL it contains 3.36± 0.29 g protein, 2.17± 0.14 g albumin, 0.77± 0.66 g total fat ; Total Glucose 0.07 ± 0.02 g, Zinc 3.34 ± 0.8 mg; Cu 2.34 ± 0.98 mg and 0.20 ± 0.09 mg Fe (Mustafa, Widodo, and Kristianto 2012). Purple eggplant (*Solanum melongena* L) as an ingredient in eating purple eggplant can also be a food coloring and has health benefits, because in purple eggplant there is an anthocyanin pigment that acts as an antioxidant(Lestari, Sumarni, and Mappiratu 2019). The purpose of this study is to determine the acceptability of biscuit products substituted with snakehead fish meal and purple eggplant flour.

METHODS

The type of research used is *quasi-experimental* research using the *posttest only control group design* with four treatments, namely the substitution of snakehead fish meal and purple eggplant flour. The ratio of wheat flour, fish meal and purple eggplant flour is F0 (100% : 0 : 0), F1 (85% : 10% : 5%), F2 (70% : 20% : 10%) and F3 (55% : 30% : 15%).

The research design scheme was in the form of X PX in the control group and the treat group with a percentage ratio of snakehead fishmeal and purple eggplant flour that varied. The research was conducted from August to October 2021 at the Food Implementation Laboratory of the Department of Nutrition, Polytechnic, Ministry of Health, Gorontalo.

Tools used in making biscuits include electric ovens, digital scales, food processors, mixers, blenders, spoons, plates, basins, knives, cutting boards, molded baking sheets, washcloths, dough grinders, biscuit carvings, sieves. While the ingredients used in biscuits making are wheat flour, snakehead fish meal, purple eggplant flour with varying ratios in the three groups, while other ingredients with the same amount in all three formulas include refined sugar, eggs, full cream milk, *baking powder*, vanilla, margarine, butter, cornstarch.

The favorability level test was carried out on semi-trained panelists, namely 30 students of the Polytechnic Nutrition Department of the Ministry of Health, Gorontalo. A semi-trained panelist is a person who is used as a subject to assess the

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organoleptic test of selected biscuits in advance. The criteria for panelists in the study included panelist not having allergies to the ingredients used in making biscuits, having a good taste buds device, healthy / not sick, willing to be a panelist without coercion and panelist knowing the whole about biscuits.

The procedure for making snakehead fish meal includes snakehead fish cleaned and greased with lime, then steamed for 30 minutes, then separated the meat from the unusable parts (bones, thorns and skin), then dried in the oven for 2 hours at a temperature of 60^0C, then ground and sifted at 80 mesh. While the procedure for making eggplant flour includes purple eggplants washed and cut into pieces, then dried for 120 minutes at a temperature of 60^0C, then ground and sifted on 80 mesh.

Meanwhile, the procedure for biscuits making includes mixing wheat flour dough, granulated sugar, eggs, margarine and fish meal and purple eggplant mixed until it becomes smooth, then adding full cream milk is done printing and roasting. Each biscuit approximately 10 - 15 gram per piece.

The way data collection is carried out for the level of favorability will be obtained from semi-trained panelists to determine the most preferred formula using the *hedonic scale test form* as a tool. Data processing of research results using *a computer.* The data that has been analyzed will be presented in the form of tables and *bar charts* as well as narratives to discuss the results of the study. Analysis of panelists' acceptability to biscuits using *friedmann* test while analysis of substitution effect on the proximate value of biscuits using statistical test s *pearman's rank.*

RESULTS AND DISCUSSION

Figure 1 shows that based on the acceptability to biscuit colors, the highest in formula 0 as a control sample, followed by formula 1 with an average value of 2.47 and the lowest in formula 3 with an average value of 1.19. The highest acceptability of biscuit flavors after control was formula 1 with an average value of 2.7 and the lowest in formula 2 with an average value of 2.12. The acceptability biscuit aroma after control (formula 0) was formula 1 with an average value of 2.42 and the lowest in formula 3 with an average value of 2.38. The acceptability biscuit crunch after control (formula 0) was formula 1 with average value of 2.65 and lowest in formula 3 with an average value of 2.23.

Table 2 shows that based on the highest color acceptability of biscuits is the acceptability of biscuits with substitution snakehead flour and purple eggplant flour of 0% (63.3%), while the lowest which was most dislike compared to all formulas was formulas 3. Results of statistical tests using the *Friedmann test* obtained *p value* = 0.000 ($\alpha < 0.05$), this means that there is a significant influence substitution snakehead fish and purple eggplant flour on the acceptability of biscuit color.

The taste of food includes 2 main aspects, namely the appearance of food when served and the taste of food when eaten and the color of food plays a major role in the appearance of food because it is the first stimulus in the sense of the eye (Solichah et al., 2021). Attractive and natural-looking food colors can enhance the taste. Similar to appearance, color is not too much of a priority, because color is only seen from the outside, if the color is good but the taste is not good, then the product is unacceptable. Research on the development of snakehead fish cookies shows that the average value of all organoleptic cookies ranges from 3.41 – 3.91 on a scale of 5. There is no significant difference in organoleptic parameters between the 50% and 60% formulas. Snakehead

Table 1. Preference test results

Component	Formulas		
	F1	F2	F3
Flavor*	3.80 ± 0.8a	3.93 ±0.98 b	3.00 ± 1.23 c
Color *	3.97 ±0.77 a	3.93 ± 0.87 b	3.30 ± 1.08 c _
Texture *	3.67 ± 0.75 a	4.03 ± 0.61 b	3.43 ± 1.13 c
Aroma	3.23 ± 1.19	3.60 ± 1.19	3.33 ± 1.18

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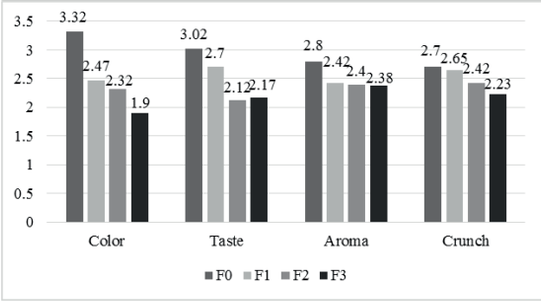

Figure 1. Characteristics of the acceptability of fishmeal substitution biscuits and purple eggplant flour

fish cookies have a nutritional content per 100 g of cookies including energy 565.9 kcal, protein 14.09 g, fat 24.33 g, carbohydrates 72.62 g, and water content 2.68% (Ganap et al. 2020). The addition of fishmeal has a noticeable effect on color is also found in the manufacture of fish nugget products (Solichah et al. 2021). Likewise, the manufacture of cookie products with the substitution of the addition of snakehead fish meal and surimi flour shows a noticeable color difference based on the concentration of the composition of the flour used (Misshella, 2019). Biscuits substitution with snakehead fish and purple eggplant in high percentage have low acceptability compared to the lowest percentage substitute material, it was because high composition of sneakhead fish give impact in texture and strong fish taste.

The highest acceptance of biscuit taste is the acceptance of very liking biscuits with the substitution of snakehead fish and purple eggplant flour 0% (56.7%), while the most receptive is the very dislike acceptance of biscuits with the substitution of snakehead fish and purple eggplant flour 10% and 20% (0%) and the acceptability of likes with the substitution of snakehead fish and purple eggplant flour 0% (0%). Many panelists were prefer formula 0 more because it was basic formula to make biscuit, there not additional substitution material from snekehead fish and purple eggplant flour.

Results of statistical tests using the *Friedmann test* obtained *p value* = 0.003 ($\alpha > 0.05$), this means that there is no effect of snakehead fish substitution and purple eggplant flour on the taste

Table 2. Analysis of the relationship of acceptability based on aspects of color, taste, aroma and crispness of biscuits substitution of snakehead fish and purple eggplant

Variable	Acceptability										p value
	SD		D		AL		L		VL		
	n	%	n	%	n	%	n	%	n	%	
Color											
F0	0	0,0	0	0,0	1	3,3	19	63,3	10	33,3	0,000
F1	0	0,0	2	6,7	9	30,0	14	46,7	5	16,7	
F2	0	0,0	2	6,7	11	36,7	11	36,7	6	20,0	
F3	0	0,0	5	16,7	12	40,0	9	30,0	4	13,3	
Taste											
F0	1	3,3	0	0,0	4	13,3	8	26,7	17	56,7	0,003
F1	0	0,0	2	6,7	6	20,0	11	36,7	11	36,7	
F2	0	0,0	4	13,3	9	30,0	9	26,7	9	30,0	
F3	1	3,3	2	6,7	6	20,0	6	50,0	6	20,0	
Aroma											
F0	1	3,3	0	0,0	3	10,0	13	43,3	13	43,3	0,306
F1	1	3,3	2	6,7	7	23,3	7	23,3	13	43,3	
F2	1	3,3	1	3,3	4	13,3	14	46,7	10	33,3	
F3	0	0,0	2	6,7	8	26,7	8	26,7	12	40,0	
Crunch											
F0	0	0,0	0	0,0	4	13,3	8	26,7	18	60,0	0,155
F1	0	0,0	0	0,0	4	13,3	10	33,3	16	53,3	
F2	0	0,0	0	0,0	6	20,0	9	30,0	15	50,0	
F3	0	0,00	1	33,3	4	13,3	12	40,0	13	43,3	

Abbreviations; SD = strongly dislike; D = dislike; AL = almost like; L = like; VL = very like

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acceptability of biscuits.The taste of food is the second factor that determines the taste of food after the appearance of the food itself. If the appearance of the food served stimulates the nerves through the sense of sight so that it is able to arouse the appetite to taste the food, then in the next stage the taste of the food will be determined by stimulation of the sense of smell and sense of taste.

The taste plays an important role in the selection of products by consumers, because even though the nutritional content is good, if taste is not acceptable to consumers, people will not willing to consume thus arget of increasing people's nutritional intake cannot be achieved. The results of research on the nutritional value and acceptability of snakehead fish cookies as a complementary food for pregnant women in Sleman Regency, Yogyakarta showed that the average value of all organoleptic parameters of cookies ranged from 3.41 to 3.91 on a scale of 5. There was no significant difference on the parameters organoleptic between the formulas 50% and 60% ($p < 0.05$) (Ganap et al. 2020).

There is an effect of snakehead fish substitution and purple eggplant flour on the receptivity of biscuit aromas where panelists tend to like the taste of biscuits with formula 0. Panelists who tend to like formulas without snakehead fish substitution and purple eggplant flour are caused because biscuits still have an original, distinctive and fragrant taste.

Based on the highest aroma acceptability of biscuits is the acceptability of likes on biscuits with the substitution of snakehead fish and purple eggplant flour 20% as many as 14 people (46.7%), while the most receptive is the very dislike receptivity of biscuits with the substitution of snakehead fish and purple eggplant flour 30% as much as 0 people (0%) and the acceptability of likes with snakehead fish substitution and purple eggplant flour 0% as much as 0 people (0%). Results Statistical tests using *the Friedmann test* obtained *p value* = $0.306 > \alpha = 0.05$), this means that there is no effect of snakehead fish substitution and purple eggplant flour on the receptivity of biscuit aroma.

The aroma that is spread by food is a very strong attraction and is able to stimulate the sense of smell so as to arouse appetite. The emergence of food aroma is caused by the formation of volatile compounds as a result or reaction due to the work of enzymes or can also be formed without the help of enzyme reactions (Solichah et al., 2021).

Similarly, the aroma is an important factor in food products by consumer, where the taste of a food is largely determined by the aroma factor. In many ways the aroma becomes its own attraction in determining the good taste of the food product itself (Solichah et al., 2021). The results of the snakehead fish cookies development study showed that the average of all organoleptic parameters of tick cookies ranged from 3.41 – 3.91 on a scale of 5. There was no significant difference in the organoleptic parameters of tic between the formulas 50% and 60% ($p < 0.05$) (Ganap et al. 2020).

There was no effect of snakehead fish and purple eggplant flour substitution on the acceptance of biscuit aroma. Panelist likes and dislikes tend to be balanced. This is because the biscuits without snakehead fish and purple eggplant flour still have a dominant flavor was fish and vegetable flavor, which some panelists like. On the other hand, the panelists who tended to dislike biscuits with snakehead fish and purple eggplant flour substitutions were more due to the fact that the biscuits were not too flavorful because the biscuit aroma began to be covered with other dough.

Based on the highest acceptability of biscuit crispness is the acceptance of very liking biscuits with the substitution of snakehead fish and purpleeggplant flour 0% (60%), while the most receptive is the very dislike acceptability of biscuits with all formulas and the acceptability of likes with the substitution of snakehead fish and purple eggplant flour 0%, 10%, 20% (0%). Results Statistical tests using the *Friedman test* obtained *p value* = 0.155 ($\alpha > 0.05$), this means that there is no effect of snakehead fish substitution and purple eggplant flour on the crispness acceptability of biscuits.

The consistency or texture of food is also a component that also determines the taste of food because the sensitivity of the taste buds is influenced by the consistency of the food. Foods with a thick consistency will stimulate the sense of taste more slowly.Crispness is a supporting factor in the selection of food products by

consumers because the product is considered to have a certain level of crispness so that the texture also determines the acceptance of the biscuit. There was no effect of snakehead fish and purple eggplant flour substitution on the acceptability of the crispness of the biscuits where the panelists tended to be balanced between those who disliked and those who liked all biscuit formulas. This is because the crispness of the biscuits for all formulas is almost the same, which is a bit hard. Panelists who didn't like it because the biscuits weren't crunchy made chewing difficult, while those who liked them were more because they felt the biscuits were a bit crunchy. The addition of snakehead fish has an impact on the level of crispiness of fish nuggets (Solichah et al. 2021). Likewise, in the manufacture of cookie products by substituting the addition of snakehead fish flour and surimi flour, there is a significant difference in texture based on the concentration of the flour composition ratio used (Mishella, 2019).

CONCLUSION

There is an effect of substitution of snakehead fish and purple eggplant flour on color acceptability ($p = 0.000$) and taste ($p = 0.003$) between F0-F3, there is no effect of substitution of snakehead fish meal and purple eggplant flour on aroma receptivity ($p = 0.306$) and crispness ($p = 0.155$). We suggested to develop biscuits product for prevention of malnutrition based on local food, such as snakehead fish and purple eggplant.

REFERENCES

BSN. 2011. *Biskuit SNI 01-2973-2011*. Jakarta: BSN.

Dahlia, Dahlia, Sumarto Sumarto, Desmelati Desmelati, Suparmi Suparmi, and Tjipto Leksono. 2019. "Penerapan Teknologi Diversifikasi Biskuit Dengan Penambahan Tepung Ikan Gabus (Ophiocephalus Striatus) Di Desa Pangkalan Pisang Kecamatan Koto Gasib Kabupaten Siak Provinsi Riau." *Journal of Rural and Urban Community Empowerment* 1(1):41–50.

Ganap, Eugenius Phyowai, Riantina Rizky Amalia, Pakartian Ayu Sugmana, and Laksmi Ika Hidayati. 2020. "Nilai Gizi Dan Daya Terima Cookies Ikan Gabus Sebagai Makanan Tambahan Untuk Ibu Hamil Di Kabupaten Sleman, DIY." *Jurnal Kesehatan Reproduksi* 7(3):133–40.

Kemenkes, R. I. 2021. "Hasil Studi Status Gizi Indonesia (SSGI) Kabupaten." *Kota Tahun* 2021.

Kemenkes, RI. 2016. *Situasi Gizi*. Jakarta: Kemenkes RI.

Kemenkes, RI. 2018. *Hasil Riset Kesehatan Dasar (Riskesdas) 2018*. Jakarta: Kemenkes RI.

Lestari, Efin, Ni Ketut Sumarni, and Mappiratu Mappiratu. 2019. "KAJIAN AKTIVITAS ANTIOKSIDAN MIKROKAPSUL EKSTRAK KULIT TERONG UNGU (Solanum Melongena L)." *KOVALEN: Jurnal Riset Kimia* 5(3):299–307.

Marlina, Paramitha Wirdani Ningsih, Raden Roro Dwi Agustine Maulianti, and Maria Meylan Yuliany Fernandez. 2018. "Pengembangan Biskuit MPASI Berbahan Dasar Berbagai Macam Tepung Sebagai Produk Inovasi MPASI." *Media Gizi Mikro Indonesia* 10(1):27–38.

MISSHELLA, S. U. I. TANIA. 2019. "PHYSICO-CHEMICAL CHARACTERISTICS AND ORGANOLEPTIC OF COOKIES MADE FROM COMBINATION OF CATFISH (Clarias Gariepinus) SURIMI FLOUR AND JOB'S TEARS (Coix Lachryma-Jobi L.) FLOUR."

Mustafa, Annasari, M. Aris Widodo, and Yohanes Kristianto. 2012. "Albumin and Zinc Content of Snakehead Fish (Channa Striata) Extract and Its Role in Health." *IEESE International Journal of Science and Technology* 1(2):1.

SOLICHAH, Enny, Ade Chandara IWANSYAH, Devry PRAMESTI, Dewi DESNILASARI, Wawan AGUSTINA, Woro SETIABOMA, and Ainia HERMINIATI. 2021. "Evaluation of Physicochemical, Nutritional, and Organoleptic Properties of Nuggets Based on Moringa (Moringa Oleifera) Leaves and Giant Catfish (Arius Thalassinus)." *Food Science and Technology* 42.

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PROVISION OF AVOCADO AND HONEY IN REDUCING HYPERTENSION IN PREGNANT WOMEN

Yusni Podungge[1*] , Febri Dwi Yanti[1] , Nangsih Sulastri Slamet[2] , Teti Sutriyati Toluli[3] , Madania[3]
[1]Midwifery Department, Health Polytechnic of Gorontalo, Gorontalo
[2]Pharmacy Department, Health Polytechnic of Gorontalo, Gorontalo
[3]Department of Pharmacy, Faculty of Sport and Health, State University of Gorontalo, Gorontalo
*E-mail: yusnipodunnge31@gmail.com

ABSTRACT

High blood pressure or hypertension in pregnant women can cause low birth weight baby. Based on the results of previous studies, provision of avocados can stabilize blood pressure become, gradually decrease and can be used as an alternative to non-pharmacological drugs. Local honey is also used because it has many health benefits and as a natural sweetener. The purpose of the study was to analyze the effect of avocados and local honey provision on hypertension in pregnancy at the Gorontalo City Health Center. This type of research is quantitative with pseudo-experimental methods with a one group pretest and posttest design approach. Avocados were given as much as 100 grams and local honey as much as 20 ml, avocado fruit is stirred together with local honey, then consumed after meals in the morning or evening. The sampling technique used is purposive sampling. Wilcoxon's test results showed 29 respondents experienced a systolic decrease and 10 respondents experienced a diastolic decrease after being given processed avocado and honey for seven days. It was found that there was an effect of giving processed avocados and honey on a significant decrease in systolic pressure with a p value < 0.005, but there was no effect of giving processed avocados and honey on reducing diastolic pressure p > 0.005 (0.767). In conclusion, processed avocados and honey can lower the blood pressure of pregnant women so it can be used as food alternatives consumed by pregnant women.

Keywords: avocado, honey, hypertension, pregnancy

ABSTRAK

Tekanan darah tinggi atau hipertensi pada ibu hamil dapat menyebabkan bayi yang dilahirkan memiliki berat badan lahir rendah, bahkan kematian. Berdasarkan hasil penelitian sebelumnya, pemberian buah alpukat dapat membuat tekanan darah seseorang menjadi stabil dan berangsur-angsur menurun serta dapat digunakan sebagai salah satu alternatif pengganti obat non farmakologi. Madu lokal juga digunakan karena memiliki banyak manfaat kesehatan dan sebagai pemanis alami. Tujuan penelitian untuk menganalisis pengaruh buah alpukat dan madu lokal terhadap hipertensi dalam kehamilan di Puskesmas Kota Gorontalo. Jenis penelitian ini adalah kuantitatif dengan metode eksperimen semu dengan pendekatan one group pretest and posttest design, alpukat yang diberikan sebanyak 100 gram dan madu lokal sebanyak 20ml, buah alpukat di aduk bersamaan dengan madu lokal, kemudian dikonsumsi setelah makan pada pagi atau sore hari. Teknik pengambilan sampel yang digunakan adalah purposive sampling. Hasil uji Wilcoxon menunjukkan 29 responden mengalami penurunan sistolikdan 10 responden mengalami penurunan diastolik setelah diberikan olahan alpukat dan madu selama tujuh hari. Ditemukan bahwa ada pengaruh pemberian olahan alpukat dan madu terhadap penurunan tekanan sistolik secara signifikan dengan p value < 0,005 namun tidak ada pengaruh pemberian olahan alpukat dan madu terhadap penurunan tekanan diastolik p > 0,005 (0,767). Kesimpulannya, olahan alpukat dan madu dapat menurunkan tekanan darah ibu hamil sehingga dapat dijadikan alternatif konsumsi bagi ibu hamil.

Kata kunci: *alpukat, hipertensi, kehamilan, madu*

INTRODUCTION

Indonesia experiences a *double burden* of diseases, namely non-communicable diseases and communicable diseases that occur at the same time. Hypertensive in pregnancy is a vascular disorder that occurs before pregnancy or appears during pregnancy or during the puerperium. Hypertension in pregnancy often occurs and is still one of the causes of maternal death (Sari et al., 2016). It affects about 10% of all

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pregnant women worldwide. These diseases and conditions include preeclampsia and eclampsia, gestational hypertension and chronic hypertension. Hypertension in pregnancy is an important cause of severe acute morbidity, long-term disability and maternal and infant mortality (Bekti et al., 2020).

Pregnant women who experience anxiety and stress can cause their blood pressure to rise. High blood pressure or hypertension in pregnant women can cause babies born to have low birth weight, even death, and can also have an impact on imperfect fetal growth, premature birth, low birth weight, even maternal and infant mortality (Chabibah & Khanifah, 2018). In pregnant women who suffer from hypertension, the anxiety felt can affect the psychological condition of the mother even to the condition of the fetus (Ary et al., 2022).

Data from the World Health Organization (WHO) in 2015 showed that about 1.13 billion people in the world have hypertension, meaning that 1 in 3 people in the world is diagnosed with hypertension. The number of people with hypertension continues to increase every year, it is estimated that in 2025 there will be 1.5 billion people affected by hypertension, and it is estimated that every year 10.44 million people die from hypertension and its complications (P. K. Kesehatan, 2019). Data from the Gorontalo Provincial Health Office in 2018 obtained data on the number of people with hypertension as many as 23,684 people, with the highest number in Gorontalo City 12,263 people (Podungge, 2020).

Indonesia, which is a low-to-middle income country, MMR is still 205 per 100,000 live births in 2020 and this is still far from the SDGs target of 70 deaths per 100,000 live births. In Gorontalo Province, there has been an increase in MMR from 2019 by 29 to 40 cases in 2020. The cause of maternal death is pre-eclampsia, which is one of the criteria for hypertension in pregnancy Indonesia which is a middle-income country (K. Kesehatan, 2018).

In the Province, the maternal mortality rate (MMR) in 2020 is 56 per 100,000 KH spread across Gorontalo City 9 people, Gorontalo Regency 20 people, Boalemo Regency 3 people, Pohuwato Regency 4 people, Bone Bolango Regency 7 people and North Gorontalo Regency 13 people. The causes of AKI are eclampsia 13, bleeding 13, infection 5, anemia 2, blood disorder 2 and others 23.

Based on the results of previous studies, giving avocados in a certain period of time can make a person's blood pressure stable and gradually decrease. Provides significant results and can be used as an alternative in replacing non-pharmacological drugs. Therapy using avocados and honey has been found to have desirable effects and be useful in the treatment of certain diseases (Natar Fitri Napitupulu1, Mastiur Napitupulu2, 2020).

Honey is a liquid that resembles syrup produced by honey bees. The honey given is trigona honey or Tahudu produced locally in Gorontalo Province. In addition to benefits in lowering blood pressure, honey is also used as a natural sweetener and adds to the attractiveness of pregnant women in consuming avocados (Aini et al., 2018; Podungge et al., 2022)

Based on this background, researchers are interested in further examining how the effect of processed avocados and local honey on hypertension in pregnancy in the Gorontalo City Health Center area.

METHODS

This research is quantitative research with *quasi-experimental methods* using *one group pretest* and *posttest design approaches*. The study population was all pregnant women who had a diagnosis of hypertension at the Gorontalo City Health Center, with a total sample of 30 respondents. The sampling technique used in this study is *purposive sampling*, which is determining samples with certain considerations. Samples are taken if they meet the following inclusion criteria: age ≥20 years and <40 years, gestational age ≥20 weeks to <36 weeks, blood pressure ≥140 mmHg and <160/110 mmHg, diastolic ≥90 mmHg, do not have kidney disease or diabetes and do not have multiple pregnancies. This research was conducted from June to December 2022. This research procedure measures blood pressure in respondents, if the blood pressure is high followed by giving avocado fruit and local honey which will be consumed for 7 days, after consumption

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of avocado fruit and honey, blood pressure checks are carried out again to assess whether the blood pressure of pregnant women drops or not. Data analysis was carried out with the Wilcoxon test and processed using SPSS version 16.0.

The research was conducted starting with compiling research recommendations and continued with research coordination activities at the Head of the Puskesmas to obtain permission to conduct research and request data on hypertensive pregnant women from the Coordinating Midwife. The determination of respondents is based on objective criteria (*purposive sampling).*

Blood pressure of respondents was measured and given avocados and local honey for seven days with assistance from the research team who then measured their blood pressure again after treatment time. The research data were tested with *the Wilcoxon test*.

RESULTS AND DISCUSSIONS

The results of a study of 30 pregnant women with hypertension spread across 7 districts in Gorontalo City showed that the highest number of pregnant women with hypertension with the standard criteria used were in Hulonthalangi District and Kota Timur, (23% and 30%, respectively) (Table 1).

Blood pressure measurement was done 2 times, before and after intervention. The results of these measurements were then tested statistically to determine the effect of giving avocados and honey on hypertension in pregnant women. The results of descriptive analysis showed that the mean systolic value before treatment (pre) was 143.67 mmHg and after treatment (post) decreased to 119.67 mmHg. While the mean diastolic value before treatment (pre) was 84 mmHg and after treatment (post) became 83.67 mmHg.

Table 1. Respondent distribution

Puskesmas	n	%
Kota Barat	4	13.3
Kota Utara	3	10.0
Kota Tengah	2	6.7
Kota Selatan	2	6.7
Kota Timur	9	30.0
Dumbo Raya	3	10.0
Hulonthalangi	7	23.3

The results of the *Wilcoxon test* showed that 29 respondents experienced a systolic decrease and 10 respondents experienced a diastolic decrease after being given processed avocado and honey for 7 days. Based on these results, it was found that there was an effect of giving avocados and local honey on a decrease in systolic pressure with a pvalue of <0.005 but no effect of giving avocados and local honey on a decrease in diastolic pressure p> 0.005 (0.767). In accordance with the results of Margowati's research (2016), the significance value of systolic blood pressure before and after giving avocados on day 1 to day 7 is <0.05, meaning there is an effect of avocados on reducing systolic blood pressure. While on day 7 diastolic blood pressure was not significant >0.419, meaning it had no effect on reducing diastolic blood pressure (Margowati et al., 2016).

Hypertension is a major risk factor for cardiovascular disease and a leading cause of heart failure, sudden death, stroke, coronary heart disease and renal insufficiency (Tika, 2021). Non-pharmacological treatments for hypertension need to be developed such as consuming honey (Ainurrafiq et al., 2019). Hypertension or high blood pressure occurs due to a continuous increase in blood pressure in the arteries that exceeds the normal limits of blood pressure. If a person has a history of hypertension, blood pressure is more than 140/90 mmHg. Meanwhile, the normal limit of systolic blood pressure is 120 mmHg and diastolic blood pressure is 80 mmHg. Hypertension consists of two types, namely controlled hypertension and uncontrolled hypertension. Controlled hypertension defined if a person has regular blood pressure checks, and manages a good treatment pattern. However, uncontrolled hypertension eventually results in adverse effects such as heart attack, stroke, as well as kidney disorders and blindness (Rustiawati & Sulastri, 2021; Wanda Millenia Alwie, Nur Masyitah Z, 2020).

Hypertension is often caused by various factors such as obesity, lack of physical activity, smoking behavior, a diet containing sodium and saturated fat. Hypertension is one of the number one causes of death globally. It also lead to coronary heart disease, cardiac infarction (blockage

of blood vessels causing tissue damage) (54%), stroke (36%) kidney failure (32%) (Ferrara, 2020; James-Martin et al., 2023).

Hypertension in pregnancy affects about 10% of all pregnant women worldwide. These diseases and conditions include preeclampsia and eclampsia, gestational hypertension and chronic hypertension. It is an important cause of severe acute morbidity, long-term disability and maternal and infant mortality. Almost one-tenth of all maternal deaths in Asia and Africa are related to hypertension in pregnancy, while a quarter of all maternal deaths in Latin America are caused by complications. Most deaths associated with hypertensive disorders can be avoided by providing adequate time and effective treatment for women, especially those with complications (Nursila & Sutarno, 2022; Rohmani et al., 2015; Sari et al., 2016)

Avocado (*Persea americana*) is a fruit that is often found. This versatile fruit has many benefits and properties for humans. There are many substances rich in benefits contained in this fruit. The parts of avocados used for herbs are fruit flesh (*Perseae fructus*), leaves (*Perseaefolium*), seeds (*Perseae cement*), and tree bark (*Perseae cortex*). Avocados contain high potassium and flavonoids so that they can lower blood pressure (Jimenez et al., 2021)

According to Novi (2016), avocados can treat and prevent hypertension or lower blood pressure. This is because it contains flavonoids that are efficacious as diuretics. Diuretic ability, which secretes a number of fluids and electrolytes and toxic substances. The impact that there is a decrease in the amount of water and salt will indirectly relax and blood pressure will fall. In this case, avocados play a role in lowering high blood pressure because they contain oleic acid, macro and micro minerals. The macro minerals found in avocados are calcium, potassium, sodium, magnesium and phosphorus, while micro minerals include iron, manganese and zinc. Per 100 gr of avocado contains 1166 mg potassium, 67 mg magnesium, 30 mg calcium, and 18 mg sodium. Avocados contain potassium which can lower blood pressure by increasing sodium excretion, suppressing renin secretion, dilating arterioles and reducing response to androgen vasoconstriction. In this case, flavonoids affect the renin-angiotensin system so that it can lower blood pressure (Sari et al., 2016).

In dealing with cardiovascular disease, avocados have a considerable influence because they have important compounds, namely folic acid, pantothenic acid, niacin, vitamins B1, B6, C, and E. Avocados also contain minerals, namely phosphorus, iron, potassium, magnesium, and glutathione, also rich in fiber and monounsaturated fatty acids. Then in the Yusri et al (2016) study, giving avocado juice on the blood pressure of hypertensive patients at WK Batoh Puskesmas Leung, Banda Aceh City, it was found that the average blood pressure before giving avocado juice was 95.75 mmHg and the average pressure after giving avocado juice was 83.25. In this case there was a decrease in blood pressure of 12.4 mm Hg. There was a significance effects of giving avocado juice for a decrease in low blood pressure $P = 0.000$ ($P < 0.05$). Thus it can be said that avocado juice treatment has an effect on lowering blood pressure (Yusra et al., 2016).

Avocado have many benefits, almost all parts of the avocado plant have medicinal properties. The part of the avocado plant that has many benefits is the fruit. In avocados contain oils that regulate levels of bad cholesterol (LDL) in the blood with good cholesterol (HDL), and increase the bioavailability of vitamins and fat-soluble phytochemicals. Avocado is also a good source of folic acid which is needed to develop fetal nerves which are important for the brain (Munhuweyi et al., 2020)

CONCLUSION

Provision of avocado and honey can reduce blood pressure of pregnant women so as to prevent complications of hypertension in pregnancy. Suggestions for future researchers are to increase sample size and examine the food intake of pregnant women and risk factors that can affect pregnant women's blood pressure.

REFERENCES

Aini, R., Publikasi, N., Keperawatan, P. S., Kedokteran, F., & Tanjungpura, U. (2018). *Pengaruh pemberian madu terhadap perubahan*

tekanan darah pada penderita hipertensi di wilayah kerja upk puskesmas khatulistiwa kecamatan pontianak utara.

Ainurrafiq, A., Risnah, R., & Ulfa Azhar, M. (2019). Terapi Non Farmakologi dalam Pengendalian Tekanan Darah Pada Pasien Hipertensi: Systematic Review. *Media Publikasi Promosi Kesehatan Indonesia (MPPKI)*, *2*(3), 192–199. https://doi.org/10.56338/mppki.v2i3.806

Ary, M., Baharuddin, A., & Idrus, H. (2022). Determinan Epidemiologi Kejadian Hipertensi Kehamilan. *Window of Health : Jurnal Kesehatan*, *5*(2), 592–601. https://doi.org/10.33096/woh.v5i02.47

Bekti, S. U., Utami, T., & Siwi, A. S. (2020). Hubungan Riwayat Hipertensi dan Status Gizi dengan Kejadin Preeklamsia pada Ibu Hamil. *Jurnal Ilmu Keperawatan Maternitas*, *3*(2), 22–28. https://doi.org/10.32584/jikm.v3i2.703

Chabibah, N., & Khanifah, M. (2018). EFEKTIVITAS PREGNANCY MASSAGE TERHADAP TEKANAN DARAH PADA IBU HAMIL TRIMSETER III EFFECTIVENESS OF PREGNANCY MASSAGE ON BLOOD PRESSURE IN PREGNANT WOMAN THIRD TRIMSETER The 8 th University Research Colloquium 2018 Universitas Muhammadiyah Purwokerto. *University Research Colloquium*, 360–365.

Ferrara, L. (2020). Live Better Adding Avocado Fruit To Your Daily Diet. *International Journal of Engineering Applied Sciences and Technology*, *5*(4), 343–347. https://doi.org/10.33564/ijeast.2020.v05i04.053

James-Martin, G., Brooker, P. G., Hendrie, G. A., & Stonehouse, W. (2023). Avocado Consumption and Cardiometabolic Health: A Systematic Review and Meta-Analysis. *Journal of the Academy of Nutrition and Dietetics*. https://doi.org/10.1016/j.jand.2022.12.008

Jimenez, P., Garcia, P., Quitral, V., Vasquez, K., Parra-Ruiz, C., Reyes-Farias, M., Garcia-Diaz, D. F., Robert, P., Encina, C., & Soto-Covasich, J. (2021). Pulp, Leaf, Peel and Seed of Avocado Fruit: A Review of Bioactive Compounds and Healthy Benefits. *Food Reviews International*, *37*(6), 619–655. https://doi.org/10.1080/87559129.2020.1717520

Kesehatan, K. (2018). *Profil Kesehatan Indonesia*.

Kesehatan, P. K. (2019). *Kendalikan Tekanan Darahmu Dengan Cerdik*.

Margowati, S., Priyanto, S., Wiharyani, M., Kesehatan, F., & Magelang, U. M. (2016). Efektivitas Pengunaan Rebusan Daun Alpukat Dengan Rebusan Daun Salam Dalam Penurunan Tekanan Darah Pada Lansia. *Universty Research Coloquium*, 234–248.

Munhuweyi, K., Mpai, S., & Sivakumar, D. (2020). Extension of avocado fruit postharvest quality using non-chemical treatments. *Agronomy*, *10*(2). https://doi.org/10.3390/agronomy10020212

Natar Fitri Napitupulu1, Mastiur Napitupulu2, H. S. (2020). PENGARUH PEMBERIAN MADU LEBAH TERHADAP TEKANAN DARAH PADA LANSIA. *Chmk Nursing Scientific Journal*, *4*(3 September).

Nursila, & Sutarno, M. (2022). *The Effect Of Avocado Fruit On The Nutritional Needs Of Pregnant Women Trimeter I At Pmb Tati Hidayat Jati Rahayu Bekasi In 2022*. 558–566.

Podungge, Y. (2020). Gorontalo. *Hubungan Umur Dan Pendidikan Dengan Hipertensi Pada Menopause*, *3*(2), 154–161.

Podungge, Y., Yanti, F. D., Slamet, N., Tuloli, T. S., & Madania. (2022). *Cegah Hipertensi dengan Alpukat*. CV.MKS. Publishing.

Rohmani, A., Setyabudi, M. T., & Puspitasari, D. R. (2015). Faktor Resiko Kejadian Hipertensi dalam Kehamilan. *Fakultas Kedokteran Universitas Muhammadiyah Semarang*, *4*, 1–9.

Rustiawati, E., & Sulastri, T. (2021). Tanpa Preload Cairan Ringer Laktat Pada Pasien Pasca Anestesi. *Ilmiah Keperawatan*, *2*(1), 1–8.

Sari, N. K., Hakimi, M., & Rahayujati, T. B. (2016). Determinan gangguan hipertensi kehamilan di Indonesia. *Journal of Community Medicine and Public Health*, *32 nomor 9*, 295–302.

Tika, T. T. (2021). PENGARUH PEMBERIAN DAUN SALAM (Syzygium polyanthum) PADA PENYAKIT HIPERTENSI : SEBUAH STUDI LITERATUR. *Jurnal Medika*, *03*(01), 1260–1265. http://www.jurnalmedikahutama.com/index.php/JMH/article/download/263/177

Wanda Millenia Alwie, Nur Masyitah Z, H. K. (2020). Pemberian Kombinasi Buah Alpukat (Persea americana) dan Rebusan Air Daun Salam (Syzygium polyanthum) Terhadap Penurunan Tekanan Darah pada Pasien Hipertensi. *Proceeding of Mulawarman Pharmaceuticals Conferences*, *12*, 79–86.

Yusra, I., Ahmad, A., & Al-Rahmad, A. H. (2016). Pengaruh Pemberian Jus Alpukat Terhadap Tekanan Darah Penderita Hipertensi Di Batoh Wilayah Kerja Puskesmas Lueng Bata Kota Banda Aceh. *AcTion: Aceh Nutrition Journal*, *1*(1), 27. https://doi.org/10.30867/action.v1i1.5

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EXAMPLES OF REFERENCES WRITING

a. **References from books**

- Contento, I. R. (2011). Nutrition education (2nd ed.). Sadburry, Massachusetts: Jones and Bartlett Publishers.
- Mahan, L. K., & Raymond, J. L. (2017). *Krause's food & the nutrition care process*. Canada: Elsevier Health Sciences.

b. **Books or reports composed by organizations, associations, or government agencies**

Kementerian Kesehatan. (2013). *Hasil Riset Kesehatan Dasar 2013.* Jakarta: Badan Penelitian dan Pengembangan Kesehatan, Kementerian Kesehatan RI.

c. **Book chapters on a book that has editors**

Brown, J.E. (2011). Nutrition through the life cycle (4th Ed.). Janet Sugarman Isaacs, *Infant Nutrition* (pp. 223–225). Belmont, CA, USA: Wadsworth.

d. **Conference manuscript – online**
Bochner, S. (1996). Mentoring in higher education: Issues to be addressed in developing a mentoring program. Paper presented at the Australian Association for Research in Education Conference, Singapore. Retrieved from http://www.aare.edu.au/96pap/bochs96018.txt

e. **Manuscripts from a journal**
El-Gilany, A. H., & Elkhawaga, G. (2012). Socioeconomic determinants of eating pattern of adolescent students in Mansoura, Egypt. *The Pan African Medical Journal*, 13, 22. https://doi.org/10.4314/pamj.v13i1.

McDonald, C. M., McLean, J., Kroeun, H., Talukder, A., Lynd, L. D., & Green, T. J. (2015). Correlates of household food insecurity and low dietary diversity in rural Cambodia. *Asia Pacific Journal of Clinical Nutrition*, 24(4), 720–730. https://doi.org/10.6133/apjcn.2015.24.4.14

Diana, R., Sumarmi, S., Nindya, T. S., Rifqi, M. A., Widya, S., & Rhitmayanti, E. (2017). *Household Income and Unbalanced Diet Among Urban Adolescent Girls. Proceedings ofthe 4th Annual Meeting ofthe Indonesian Health Economics Association (INAHEA 2017)*.

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Hilgendorf, M. (2018). *Assessing malnutrition in liver disease patients being evaluated for transplant using the nutrition focused physical exam* (Unpublished master's thesis). University of Kentucky, Lexington, Kentucky.

Diana, R. (2014). *Pengaruh pemanfaatan pekarangan dan penyuluhan terhadap konsumsi sayur dan asupan gizi rumah tangga dan balita.* Institut Pertanian Bogor.

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Hilgendorf, M. (2018). *Assessing malnutrition in liver disease patients being evaluated for transplant using the nutrition focused physical exam* (Master's thesis, University of Kentucky, Lexington, Kentucky). Retrieved from https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1065&context=foodsci_etds

h. **Web page (if referenced are a few pages on the same web page, use the homepage page)**
SStatistic Bureau of East Java. (2018). Number and Percentage of Poor, P1, P2 and Poverty Line By Regency / Municipality, in 2017. Retrieved November 22, 2018, from https://jatim.bps.go.id/statictable/2018/01/15/733/jumlah-dan-persentase-penduduk-miskin-p1-p2-dan-garis-kemiskinan-menurut-kabupaten-kota-tahun-2017.html

Example of tables:

Table 1. Characteristics of Patients in Malnutrition and Non-Malnutrition Groups

Karakteristik		Malnutrition (n=70)		Non-Malnutrition (n=233)		Total (n=303)	X^2	p value
		n	%	n	%			
Sex								
	Male	38	54,3	117	52,5	155	0,070	0,790
	Female	32	45,7	106	47,5	138		
Age								
	<55 years old	48	68,6	151	67,7	199	0,890	0,180
	≥55 years old	22	31,4	72	32,3	94		
Education								
	Low	24	34,3	51	22,9	75	10,153	0,063
	Middle	33	47,1	151	67,7	184		
	High	13	18,6	21	9,4	33		

Table 2. Average of Nutrition Intake in Malnutrition and Non-Malnutrition Groups

Nutrition Intake	Malnutrition (Mean ± SD)	Non-Malnutrition (Mean ± SD)	t	*p value*
Calories	1328,1± 215,3	1482,9± 327,4	2,04	0,032
Protein	43,2±13,1	48,7±17,3	2,47	0,010

Example of a figure:

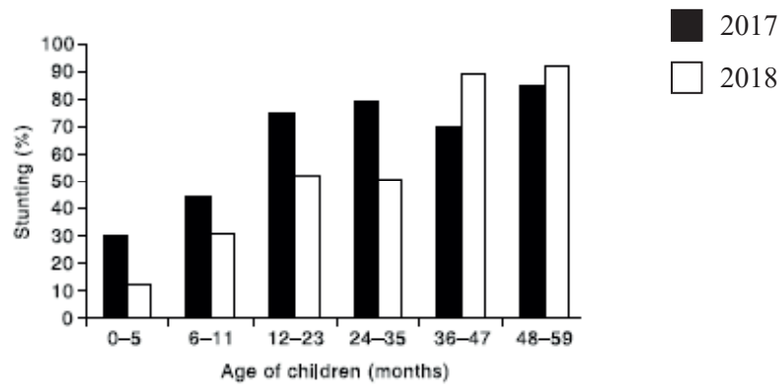

Figure 1. Changes in Stunting Prevalence (%) in Toddlers in Kalimantan

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