JPPIPA 10(11) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

The Correlation between Hygiene Habit and Body Mass Index of Healthy People

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Received: May 27, 2024
Revised: August 05, 2024
Accepted: November 25, 2024
Published: November 30, 2024

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DOI: 10.29303/jppipa.v10i11.8737

Abstract: We investigated to find out the BMI of healthy people and the relation to their health environmental habits. We surveyed walking travelers' participants who had hiking experiences in South Korea. We also analyzed the BMI classification by hand hygiene habits, shoe washing and garbage disposal maintaining for distribution BMI features. The survey was conducted through an online questionnaire. The subjects included 569 adult participants, males and females aged 20 years and older. Box plot visualization and cross-tab test were used for analysis. The results revealed that almost 48.5% of all participants handwash before meals. Statistically, it showed a significant relationship between normal calcified BMI and washing hands before eating (p-val : 0.001) and before eating snacks (p-val : 0.000). The distribution of participants who were in BMI classification of overweight (BMI 24.9~29.9) in a group that had habits of washing hands before meals when traveling showed 10% lower. The lower the number of cleaning frequencies, increasing the higher BMI. However, the impact on shoe care (washing) and waste care was negligible. The result shows that good habits in the environment, especially hand hygiene, influence the BMI. This indicates that certainty about health and some health environmental habits also affect health.

Keywords: BMI; Hygiene habits; Walking travellers'

Introduction

Nowadays technology has influenced human behavior and people are so depend upon it. The rapid development of technology has also led to adverse impact on health, causes unhealthy behavior such as a lack of physical activities resulting in an imbalanced lifestyle. Evidence has emerged identifying habitual sedentary behavior (prolonged sitting) as a significant concern (Okely et al., 2021; Haghjoo et al., 2022; Liu et al., 2023). Physical inactivity is one of important critical factor related to obesity (BMI > 30). In the US people spend an average on screen for 7.4 hours per day, with an obesity status rate of 42.4%, and a life expectancy at birth of 74.5 years for men and 80.2 years for women (Chau et al., 2012; WHO, 2020; Fomby et al., 2021; Moody, 2024). How was technology exposure in South Korea? In contrast, South Korea shows a different trend. People spend an average of 6.31 hours per day on screens, with an obesity status rate only 4% (very low), and the average life expectancy at birth is 80.5 years for men and 86.5 years for women (Yi et al., 2015; Braun et al., 2016; Benvenuti et al., 2023). It is important to study how South Korea manages to control body weight, serving as model for other countries (Dempsey et al., 2014; CDC, 2015; Won-Noh et al., 2017; Al Zaki et al., 2023).

How to Cite:
Widyaatmadja, S. T., Kim, Y.-D., & Byun, K. (2024). The Correlation between Hygiene Habit and Body Mass Index of Healthy People. *Jurnal Penelitian Pendidikan IPA*, *10*(11), 8773–8781. https://doi.org/10.29303/jppipa.v10i11.8737

One notable characteristic of South Korea is its geography. Mountains cover 70% of the landmass, making it one of the most mountainous regions in the world. This geographical advantage provides many opportunities for Korean People got great access of facilities outdoor nature physical activities and exercise, due their many routes of walking. This country has numerous walking routes that facilitate physical activity, such as the Jeju Olle Trails 130 km off the southwest coast of Korea consists of 21 main routes that loop the islands' coastal region; Seoul Dulegil (Seoul Trail) 157 km trail with 8 Courses runs around the outer edge of Seoul city; and Gangneung Baugil about 400 km along the mountain chains and the sea (Korean Peninsula Map, 2017). Walking activities give both health benefit for the body and mind (Marselle et al., 2013; Heath et al., 2022). Furthermore, the benefits of walking are extended to many aspects of health and fitness, and hygiene habits play a crucial role in maintaining health. Keeping the body clean helps prevent illness and infections from bacteria or viruses. Simple hygiene practices, such as regular handwashing as hygiene behavior, are effective in preventing the spreads of germs (CDC, 2022; 2024). Health maintenance and disease prevention can be supported through the hygiene sanitation environmental as an activity to maintaining basic environmental conditions, such as clean water supply, ambient air, and safe waste disposal that affecting the well-being of people (Gozdzielewska et al., 2022; CDC, 2024; WHO, 2014; Zaitun, 2024; Roy et al., 2022). Good personal hygiene is critical in preventing the spread of illness, in daily life and emergency situations (Wang et al., 2017; WHO, 2018; Asnidar et al., 2023). In this study, this part represented in questions to participants the health prevention through hygiene sanitation includes hand wash, shoe-wash, and garbage disposal management.

Previews research has found that house dust containing Endocrine-Disrupting Chemicals (EDCs) can alter hormones, contributing to obesity. People breathe inhale every time for their life and ingest small amounts of dust continuously, and even minimal exposure, as low as three micrograms, can have measurable effects (Kassotis et al., 2017). This highlights the importance of a clean living environment to prevent weight gain.

The novelty of this study lies in its comprehensive approach to understanding the relationship between physical activity, hygiene habits, and BMI in South Korea, a country with notably low obesity rates despite technology exposure. By investigating the environmental behavior of individuals who engage in hiking activities and their hygiene practices, this research aims to uncover key factors that contribute to maintaining a healthy BMI and overall well-being.

This study is important because provides insights into effective strategies for managing body weight and promoting health, understanding how environmental influence and outdoor facilities contribute to physical activity, emphasizes the role of hygiene habits in preventing illness and supporting health maintenance linking it to BMI and give implication public health by promote healthy lifestyles and prevent obesity in different populations. The findings of this study were contributed to the development of healthy Korean population to keep the Body Mass Index (BMI) and body weight stable, also suggestion on hygiene sanitation education habits.

In this study, we will focus on the benefits of walking activities by using BMI result data from surveys related to the environmental behavior of walking traveler participants who had hiking experiences in South Korea. We will also analyze the association of healthy people's BMI classification by hand hygiene habits, shoe-washing and garbage disposal maintenance. By uncovering these associations, this research aims to contribute to the development of effective strategies for maintaining healthy body weight and preventing obesity, ultimately improving public health outcomes.

Methods

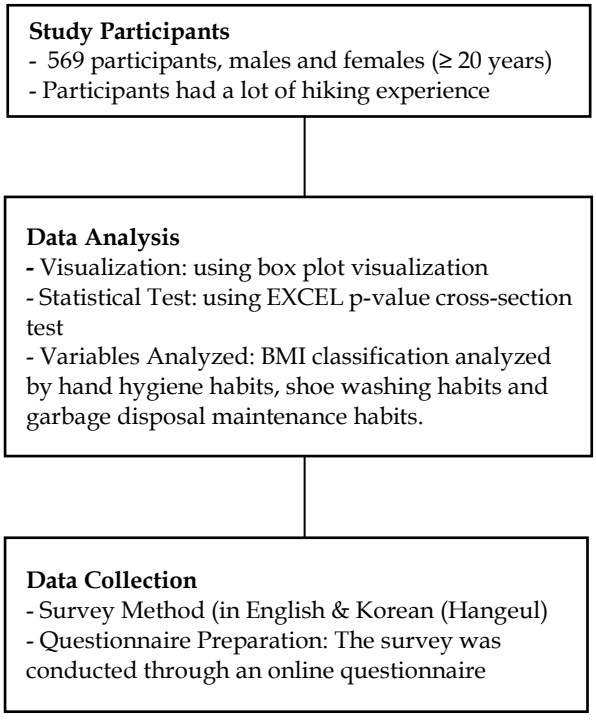

Figure 1. The flow of research

The study employed a cross-sectional design to investigate the association between hiking experience, body mass index, and personal hygiene habits among adult participants. Surveys were conducted using a Google Forms questionnaire, with hard copies available for respondents aged 60 and older to accommodate potential difficulties with online access. The questionnaire war prepared in English and Korean to cater to South Korean participants.

The sample consisted of 569 adult participants, both male and female, aged 20 and above, with extensive hiking experience. Box plot visualization and Excel p-value cross sectional tests were used for data analysis (Jeoung & Pyun, 2022; Papaconstantinou et al., 2020). To assess the relationship between BMI and personal hygiene habits, the study analyzed the participants' hand washing, shoe washing, and garbage disposal habits. Figure 1, showed the flow of research.

Result and Discussion

Participants Demographic

Table 1. Participants demographic

Variable	Category	Participants	%
Gender	Male	280	49.2
	Female	289	50.8
Age (years)	20-39	270	47.5
	40 above	299	52.5
Occupation	Student	56	9.8
	Office workers	390	68.5
	No Job	32	5.6
	Housewives	91	16.0
Education background	Primary-High school	107	18.8
	College graduate or above	462	81.2
BMI	Underweight	38	6.7
	Normal weight	439	77.2
	Overweight	92	16.2
	Obese	0	0.0

Source: Processed data (2024)

This survey was conducted through an online survey questionnaire to gather demographic information from respondents, including gender, age, occupation, education and BMI. In this study, walking tour experience followed by 100% of participants . The proportion of participants in this study was 280 male participants (49.2%) and 289 female participants (50.8%). From the group ages shown above 40 years (52.5%) slitghly higher than group ages 20-39 years (47.5%).

Overview of Research Location

The residence of participants mostly come from Seoul 33.4%, Gyeonggi-do 25.8% and 40% come from 16 province area in Korea.

Figure 2. Research location (Source: South Korea maps; www.mapsworld.com)

BMI for Walking Travellers

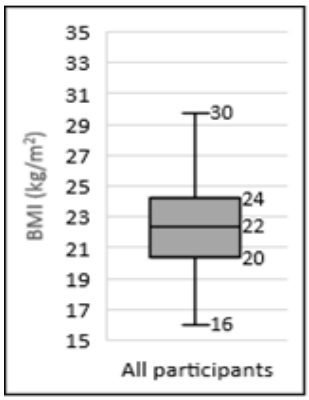

Figure 3. Box plot displaying BMI of total participants (569)

Figure 3 show a box-whisker plots of Body Mass Index (BMI) from total participants in this study. The median is approximately equal 22.4 (50th percentile). The IQR as 50th percentile distribution seen from Quartile 1 (Q1) to Quartile 3 (Q3) as 20.3-24.2 (50% distribution) in range 3.9. 75th percentile of total participants BMI distribution under 24.2. The spread of

distribution from all participants seen from minimal whisker (Whisker L) to maximal whisker (Whisker U) in range 16.0-29.7. the tails of the distribution are balanced. Furthermore, in comparison to WHO BMI standards and other countries, the obtained result of total participants by WHO BMI classifictaion in this study is more than 75% in normal weight level as normal standard as 18.5-24 (Table 2).

Table 2. BMI of Total participants by WHO BMI standard

WHO BMI Standard	< 18.5 Under weight	18.5-24.9 Normal weight	25-29.9 Over weight	Total
Participants	38	439	92	569
Portion (%)	6.7	77.2	16.2	100

Source: Processed data (2024)

The next table showed result of distribution total participants BMI in this study by Korean BMI Standard 51.3% in normal weight level as normal standard as 18.5-22.9. compare to WHO BMI Standard, BMI level in Korea be more strict limit index (Table 3).

Table 3. BMI total participants by Korean BMI standard

BMI Korean Standard	< 18.4 Under weight	18.5-22.9 Normal weight	23-24.9 Over weight	25-29.9 Obese	Total
Participants	38	292	146	93	569
Portion (%)	6.7	51.3	25.7	16.3	100

Source: Processed data (2024)

Health Prevention Through Environmental Habits

This part represented in questions to participants the health prevention through hygiene sanitation problem, include hand wash, shoewash, and garbage disposal management.

Hygiene Sanitation Problem

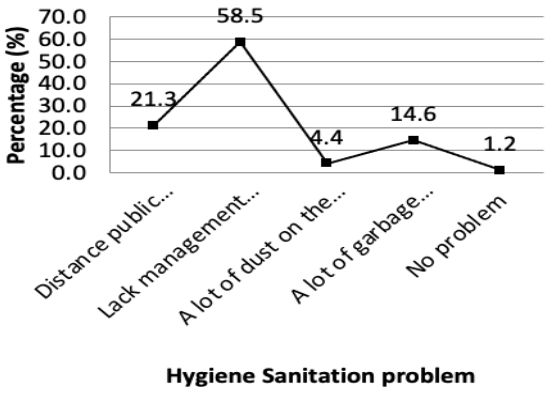

Figure 4. Hygiene sanitation problem

Based on participants experience, in this study, the biggest problem in hygiene sanitation on walking course, 58.5% insufficient management of public toilet, followed by the availibiliy of public toilet 21.3%, and 14.6% about garbage problem sorround location of hiking (Figure 4).

Hand Wash Habits During Walking

It was shown on Table 4, almost 50% participants handwash before meals. On the other hand, handwash for drinking and eating snack during walking almost depending on situation for drinking and eating snacks.

Table 4. Hand washing habits during walking

Hand wash habits	4 Almost washing	3 Washing only after stool	2 Depend on situation	1 Almost no washing
Before big meals	48.5	12.1	37.6	1.6
Before drinking	6.3	7.4	52.9	33.4
Before snacks	28.5	6.2	56.9	8.4

Source: Processed data (2024)

Shoe Wash Habits During Walking

Washing Frequency Rate (WFR), the time-frequency for washing shoes that usually wear during walking in 10-times using showed mostly participants cleans 1 time for 10 times uses.

Table 5. The frequency of shoe washing

Shoes washing Frequency	Almost No Washing (time)	Sometimes Washing (time)	Frequently Washing (time)
Washing time	0~1	2~3	4~10
		10 times using	
SWFR (%)	0~10	20~30	40~100
Portion (%)	57.3	29.2	13.5

Source: Processed data (2024)

*Shoe washing frequency rate (SWFR) is

$$\text{SWFR} = \frac{\text{Washing times}}{10 \text{ times using}} \times 100\% \quad (1)$$

Garbage Disposal Handling Habits

This study getting 87.9% of the participants habits about how they manage own garbage and throw away in a nearby garbage bin. Only 9.7% care with others trash around to collect it and throw it in the garbage

bin. The table figure shown how the environmental manage by participants.

Table 6. Handling garbage disposal

Garbage disposal managing	Put anywhere (littering)	Take and put to trash box (own garbage)	Take and put to trash box (collecting other garbage)
Portion (%)	2.5	87.9	9.7

Source: Processed data (2024)

BMI and Environmental Hygiene Sanitation Habits
BMI by Handwash Before Meals

In this study, we have compared the BMI according to the hand hygiene habits by handwashing, the lower number of the cleaning frequency, increasing the higher BMI (Figure 5).

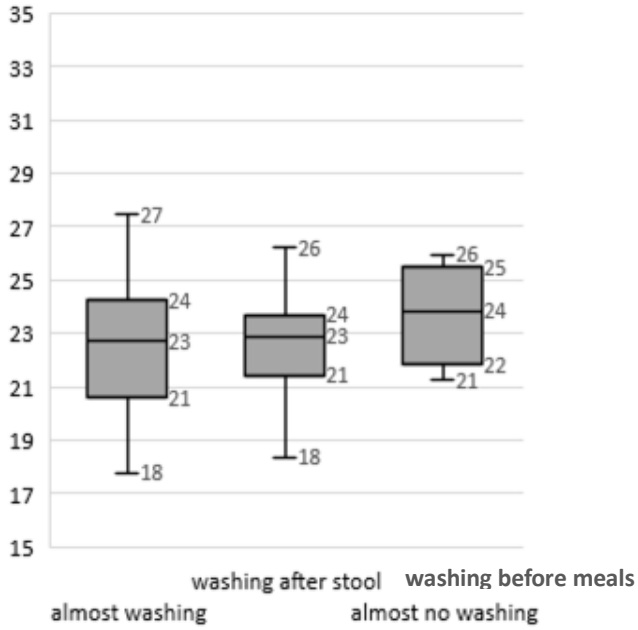

Figure 5. BMI by handwash before meals

Table 7. Association of personal hygiene by hand washing before meal by BMI classification

Handwash before meal during walking tour	WHO BMI classification						p-val
	< 18.4 under weight		18.5-24.9 normal		25-29.9 overweight		
Almost washing	24	70.6%	217	48.2%	36	42.4%	0.018
Almost no washing	10	29.4%	233	51.8%	49	57.6%	

Source: Processed data (2024)

In this study, 48.7% of all participants were almost washing, support by 70.6% underweight BMI and 48.2% normal weight BMI. In overweight BMI level, 42.4% almost washing but over half of BMI overweight participants almost no handwash before meal during walking tour (Table 7). Chi square test with p-value = 0.018 statistical test results show that these different were significant ($p < 0.05$). There is significancy association between hand wash before meal and the BMI classification.

We found, just 28.5% of all participants were almost washing, but 58.8% of underweight BMI were almost washing. In other BMI level, between 41.2-75.3% of participants almost no hand wash before snack during on course (Table 8). Chi-square test with p-value = 0.000 ($p < 0.01$), statistical test results show that these different were significant. There is significant association between hand wash before snack and the BMI level.

Table 8. Association of personal hygiene by hand washing before snack by BMI classification

Handwash before snack during walking tour	WHO BMI classification								p-val
	< 18.4 under weight		18.5-24.9 normal		25-29.9 over weight		Total		
Almost washing	20	58.8%	121	26.9%	21	24.7%	162	28.5%	0.00
Almost no washing	14	41.2%	329	73.1%	64	75.3%	407	71.5%	0

Source: Processed data (2024)

In this study, we find out that healthy people have handwashing habits before every meal. Hand wash before meals found out the trend on BMI. The results revealed that almost 48.5% of all participants handwash before meals. Statistically, it showed a significant relationship between normal calcified BMI and washing hands before eating (p-val : 0.001) and before eating snacks (p-val : 0.000). The distribution of participants who were in BMI classification of overweight (BMI 24.9~29.9) in a group that had habits of washing hands before meals when traveling showed 10% lower. The lower the number of cleaning frequencies, increasing the higher BMI.

Keeping hands clean is one of the most important steps we can take to avoid getting sick and spreading germs to others. Many diseases and conditions are spread by not washing hands with soap and clean running water (CDC, 2022; 2024). It is widely acknowledged that practicing good hand hygiene can save lives and improve the standard of care provided to patients at all levels. It is the basis for efficient and secure healthcare. These arguments emphasize how

crucial good hand hygiene is to stopping the spread of illness and preserving public health.

Findings that do not support the results of this research were carried out by Dhaifullah et al. (2019) and Değirmenci & Değirmenci (2020) showed that there was no correlation between hygienic habits and BMI. The findings of Nurudeen & Toyin (2020) show that hygienic habits are influenced by a person's gender. Hygiene is not the only factor that affects BMI. However, residents' daily activities, namely walking, have an effect on health and BMI (Sifatu et al., 2023). In contrast to the findings of Imanuddin et al. (2023) that there is a relationship between physical activity and BMI. Nurhidayah & Puspitosari (2023) found that there was a positive correlation between BMI and gout.

According to Sumardiyono et al. (2023) BMI correlates with work fatigue. Meanwhile, according to Purwanto & Ockta (2024) that socioeconomic factors are related to BMI. According to Gurrici et al. (1999) and Muriyati et al. (2023), excessive adolescent BMI correlates with high carbohydrate and fat content is more at risk of obesity. Findings of Rusdi et al. (2024) education level, low maternal age, poor toddler care and nutrient intake during pregnancy are associated with BMI. Adab et al. (2018), Jouhar et al. (2021), emphasizes that BMI plays a diverse role, including promoting health as well as correlating with the social and economic status of the community.

The results of this research are in line with the findings by Shah et al. (2023), Ranfl et al. (2022), Abdolsamadi et al. (2023), Hsu & Chiang (2020), Alam et al. (2022), Al-Khudairy et al. (2017), Bobula (2019), and Hasanuddin et al. (2023) that good habits in terms of hygiene are related to BMI.

Conclusion

The result shows that good habits in the environment, especially hand washing, influence the BMI. This indicates that certainty about health and some health environmental habits also affect health.

Acknowledgements
The author would like to thank all parties who have provided support, guidance, and direction in completing the preparation of this article. Thank you to the respondents Hopefully, this article is useful for readers.

Author's Contribution
Conceptualization, S.W., Y.K., and K.B.; methodology, S.W., and Y.K. All stages of completing this article were carried out together. All authors have read and agreed to the published version of the manuscript.

Funding
This research received no external funding. All research funds use the author's funds.

Conflict of Interest
The authors declare no conflict of interest.

References

Abdolsamadi, H., Poormoradi, B., Yaghoubi, G., Farhadian, M., & Jazaeri, M. (2023). Relationship between Body Mass Index and Oral Health Indicators: A Cross-Sectional Study. *European Journal of Translational Myology*, *33*(2). https://doi.org/10.4081/ejtm.2023.11259

Adab, P., Pallan, M., & Whincup, P. H. (2018). Is BMI the Best Measure of Obesity?'. *BMJ*, *360*, k1274. https://doi.org/10.1136/bmj.k1274

Al Zaki, M., Umar, U., Yenes, R., Rasyid, W., Ockta, Y., & Budiwanto, A. (2023). The Impact of Regular Physical Activity on Lipid Profile and Cardiovascular Health in Adolescents: A Literature Review. *Jurnal Penelitian Pendidikan IPA*, *9*(SpecialIssue), 213–221. https://doi.org/10.29303/jppipa.v9iSpecialIssue.7811

Alam, B. F., Abbasi, N., Hussain, T., Khan, M. A., Chaudhary, M. A. G., & Ijaz, F. (2022). Relationship of BMI with the Diet, Physical Activity and Oral Hygiene Practices Amongst the Dental Students. *BMC Oral Health*, *22*(1), 1–9. https://doi.org/10.1186/s12903-022-02318-8

Al-Khudairy, L., Loveman, E., Colquitt, J. L., Mead, E., Johnson, R. E., Fraser, H., Olajide, J., Murphy, M., Velho, R. M., O'Malley, C., Azevedo, L. B., Ells, L., Metzendorf, M. I., & Rees, K. (2017). Diet, Physical Activity and Behavioural Interventions for the Treatment of Overweight or Obese Adolescents Aged 12 to 17 Years. *Cochrane Database of Systematic Reviews*, *6*. https://doi.org/10.1002/14651858.CD012691

Asnidar, A., Muriyati, M., Asri, A., Safruddin, S., Haerani, H., & Hamdana, H. (2023). Health Education Against Changes in Physical Activity Patterns and Body Mass Index. *Jurnal Penelitian Pendidikan IPA*, *9*(6), 4639–4646. https://doi.org/10.29303/jppipa.v9i6.3609

Benvenuti, M., Wright, M., & Miers, A. C. (2023). How Technology Use is Changing Adolescents' Behaviors and Their Social, Physical, and Cognitive Development. *Current Psychology*, *42*, 16466–16469. https:/dx.doi.org/10.1007/s12144-023-04254-4

Bobula, G. (2019). Influence, Significance and Importance of Body Mass Index in Scientific Research and Various Fields of Science. *Am J Biomed Sci & Res*, *4*(4), AJBSR.MS.ID.000816. https://doi.org/10.34297/AJBSR.2019.04.000816

Braun, L. M., Rodriguez, D. A., Song, Y., Meyer, K. A., Lewis, C. E., Reis, J. P., & Gordon-Larsen, P. (2016). Changes in Walking, Body Mass Index, and Cardiometabolic Risk Factors Following Residential Relocation: Longitudinal Results from the CARDIA Study. *Journal of Transport & Health, Science Direct*, *3*(4), 426-439. https://dx.doi.org/10.1016/j.jth.2016.08.006

CDC. (2015). *Centers for Disease Control and Prevention*. Body Mass Index.

CDC. (2022). *Handwashing: Clean Hands Save Lives Show Me the Science – How to Wash Your Hands)*. Centers for Disease Control and Prevention. Retrieved from https://www.cdc.gov/handwashing/why-

CDC. (2024). *About Handwashing: Clean Hands*. Retrieved from https://www.cdc.gov/clean-hands/about/ index.html

Chau, J. Y., Ploeg, H. P. V. D., Merom, D., Chey, T., & Bauman, A. E. (2012). Cross-Sectional Associations between Occupational and Leisure-Time Sitting, Physical Activity and Obesity in Working Adults. *Preventive Medicine*, *54*(3-4), 195-200. https://doi.org/10.1016/j.ypmed.2011.12.02

Değirmenci, A., & Değirmenci, B. Ü. (2020). How Do the Diet, Oral Hygiene Habits and Body Mass Index Affect Tooth Caries in the Students of the Faculty of Dentistry? *Eastern Journal of Medicine*, *25*(2), 225–233. https://doi.org/10.5505/ejm.2020.15046

Dempsey, P. C., Owen, N., Biddle, S. J., & Dunstan, D. W. (2014). Managing Sedentary Behavior to Reduce the Risk of Diabetes and Cardiovascular Disease. *Current Diabetes Reports*, *14*(9), 522. https://doi.org/10.1007/s11892-014-0522-0

Dhaifullah, E., Al-Maweri, S. A., Koppolu, P., Elkhtat, E., Mostafa, D., & Mahgoub, M. (2019). Body Mass Index and Periodontal Health Status Among Young Saudi Adults: A Cross Sectional Study. *Ann Suadi Med*, *1*, 433–440.

Fomby, P., Goode, J. A., Truong-Vu, K. P., & Mollborn, S. (2021). Adolescent Technology, Sleep, and Physical Activity Time in Two US Cohorts. *Youth & Society*, *53*(4), 585–609. https://doi.org/10.1177/0044118x19868365

Gozdzielewska, L., Kilpatrick, C., Reilly, J. et al. (2022). The Effectiveness of Hand Hygiene Interventions for Preventing Community Transmission or Acquisition of Novel Coronavirus or Influenza Infections: A Systematic Review. *BMC Public Health*, *22*, 1283. https://doi.org/10.1186/s12889-022-13667-y

Gurrici, S., Hartriyanti, Y., Hautvast, J. G. A. J., & Deurenberg, P. (1999). Differences in the Relationship between Body Fat and Body Mass Index between Two Different Indonesian Ethnic Groups: The Effect of Body Build. *European Journal of Clinical Nutrition*, *53*(6), 468–472. https://doi.org/10.1038/sj.ejcn.1600778

Haghjoo, P., Siri, G., Soeleimani, E., Abbasalizad, M., & Alesaeidi, S. (2022)., Screen Time Increases Overweight and Obesity Risk Among Adolescents: A Systematic Review and Dose-Response Meta-Analysis. *BMC Primary Care*, *23*(161). https://doi.org/10.1186/s12875-022-01761-4

Hasanuddin, A., Alwi, M. K., Nindrea, R. D., Astuti, A., Dai, N. F., Maryam, A., Hasin, A., & Asrianto, L. O. (2023). Effect of Health Education on the Behavior of Elderly with Hypertension. *Jurnal Penelitian Pendidikan IPA*, *9*(9), 7023–7027. https://doi.org/10.29303/jppipa.v9i9.4506

Heath, L., Jebb, S. A., Aveyard, P., & Piernas, C. (2022). Obesity, Metabolic Risk and Adherence to Healthy Lifestyle Behaviours: Prospective Cohort Study in the UK Biobank. *BMC Medicine*, *20*, 65. https://doi.org/10.1186/s12916-022-02236-0

Hsu, W. C., & Chiang, C. H. (2020). Effect of BMI and Perceived Importance of Health on the Health Behavior of College Students: Cross-Sectional Study. *Journal of Medical Internet Research*, *22*(6). https://doi.org/10.2196/17640

Imanuddin, I., Sudarsono, I. M. R., Hariani, H., & Yuningsih, P. (2023). Correlation of Sodium Intake, Body Mass and Physical Activity with Blood Pressure. *Jurnal Penelitian Pendidikan IPA*, *9*(3), 1187–1192. https://doi.org/10.29303/jppipa.v9i3.3087

Jeoung, B., & Pyun, D. Y. (2022). Investigating Functional Fitness of Older Adults in Korea in the Period 2013–2018. *Scientific Reports*, *12*, 6073. https://doi.org/10.1038/s41598-022-09969-1

Jouhar, R., Ahmed, M. A., Khurshid, Z., & Bokhari, S. A. H. (2021). Association of BMI, Diet, Physical Activity, and Oral Hygiene Practices with DMFT Index of Male Dental Students at King Faisal University, Al-Ahsa. *Nutrients*, *13*(224). https://doi.org/10.3390/nu13010224

Kassotis, C. D., Hoffman, K., & Stapleton, H. M. (2017). Characterization of Adipogenic Activity of House Dust Extracts and Semi-Volatile Indoor Contaminants in 3T3-L1 Cells. *Environmental Science & Technology*, *51*(15), 8735–8745. https://dx.doi.org/10.1021/acs.est.7b01788

Korean Peninsula Map. (2017). *Map of North and South Korea, Korea Information and Facts*. World Maps.

Liu, Y., Zhang, H., & Xu, R. (2023). The Impact of Technology on Promoting Physical Activities and Mental Health: A Gender-Based Study. *BMC Psychology*, *11*(298). https://doi.org/10.1186/s40359-023-01348-3

Marselle, M. R., Irvine, K. N., & Warber, S. L. (2013). Walking for Well-Being: Are Group Walks in Certain Types of Natural Environments Better for Well-Being Than Group Walks in Urban Environments? *Int J Environ Res Public Health*, *10*(11), 5603. https://doi.org/10.3390/ijerph10115603

Moody, R. (2024). *Screen Time Statistics: Average Screen Time by Country*. Comparitech. Retrieved from www.comparitech.com/tv-streaming/screen-time-statistics/

Muriyati, M., Hamdana, H., Asri, A., Safruddin, S., & Asnidar, A. (2023). Fat and Carbohydrates as Causative Factors of Obesity of Youths at Bulukumba City, South Sulawesi. *Jurnal Penelitian Pendidikan IPA*, *9*(5), 2726–2731. https://doi.org/10.29303/jppipa.v9i5.3467

Nurhidayah, N., & Puspitosari, A. (2023). The Relationship between Height, Weight, Body Mass Index and Uric Acid in The Elderly Community. *Jurnal Penelitian Pendidikan IPA*, *9*(11), 9916–9920. https://doi.org/10.29303/jppipa.v9i11.5408

Nurudeen, A. S. N., & Toyin, A. (2020). Knowledge of Personal Hygiene Among Undergraduates. *Journal of Health Education*, *5*(2), 66–71. https://doi.org/10.15294/jhe.v5i2.38383

Okely A. D., Kontsevaya, A., & Abdeta, C. (2021). 2020 WHO Guidelines on Physical Activity and Sedentary Behavior. *Sports Medicine and Health Science*, *3*(2), 115-118. https://doi.org/10.1016/j.smhs.2021.05.001

Papaconstantinou, E., Quick, V., Vogel, E., Coffey, S., Miller, A., & Zitzelsberger, H. (2020). Exploring Relationships of Sleep Duration with Eating and Physical Activity Behaviors Among Canadian University Students. *Clocks & Sleep*, *2*(2), 194-207. https://doi.org/10.3390/clockssleep2020016

Purwanto, S., & Ockta, Y. (2024). Sports Nutrition and Gross Motor Skill Development in Youth Athletes: A Literature Review. *Jurnal Penelitian Pendidikan IPA*, *10*(8), 572–579. https://doi.org/10.29303/jppipa.v10i8.8991

Ranfl, M., Vurzer, B., & Zaletel-Kragelj, L. (2022). Body Mass Index as A Proxy Indicator for Poor Oral Hygiene Habits in Adult Diabetic Patients. *Zdravstveno Varstvo*, *61*(4), 209–215. https://doi.org/10.2478/sjph-2022-0028

Roy, R., Pandey, S., Ranjan, A., Kumar, P., Kumar, P., & Singh. C. M. (2022). Effect of Physical Health, Dietary Behaviour and Personal Hygiene on Body Mass Index of School Going Adolescents Near Patna, Bihar: A Cross Sectional Study. *J Family Med Prim Care*, *11*, 7136-43. https://doi.org/10.4103/jfmpc.jfmpc_977_22

Rusdi, D., Syah, N., & Yuniarti, E. (2024). The Relationship between Maternal Education Level and Stunting: Literature Review. *Jurnal Penelitian Pendidikan IPA*, *10*(10), 704–710. https://doi.org/10.29303/jppipa.v10i10.9495

Shah, M. A., Sankeshwari, R. M., Ankola, A. V., Kumar, R. S., Santhosh, V. N., Khot, A. J. P., & Varghese, A. S. (2023). Relationship between Body Mass Index (BMI) and Oral Health Status Among Government Bus Drivers of Belagavi, India: A Cross-Sectional Study. *Clinical Epidemiology and Global Health*, *23*(1), 1–6. https://doi.org/10.1016/j.cegh.2023.101360

Sifatu, W. O., Laxmi, L., & Ruwiah, R. (2023). Health Analysis and Degree of Health of Mobile Fish Sellers. *Jurnal Penelitian Pendidikan IPA*, *9*(7), 5255–5262. https://doi.org/10.29303/jppipa.v9i7.4001

Sumardiyono, S., Chahyadhi, B., Suratna, F. S. N., Fauzi, R. P., Wijayanti, R., Widjanarti, M. P., & Ada, Y. R. (2023). Effect of Noise, Blood Glucose, and Body Mass Index on Lactate Levels in Textile Industry Workers. *Jurnal Penelitian Pendidikan IPA*, *9*(SpecialIssue), 81–87. https://doi.org/10.29303/jppipa.v9ispecialissue.6009

Wang, Z., Lapinski, M., Quilliam, E., Jaykus, L. A., & Fraser, A. (2017) The Effect of Hand-Hygiene Interventions on Infectious Disease-Associated Absenteeism in Elementary Schools: A Systematic Literature Review. *American Journal of Infection Control*, *45*, 682–689. https://doi.org/10.1016/j.ajic.2017.01.018

WHO. (2014). *Preventing Diarrhoea Through Better Water, Sanitation and Hygiene*. Retrieved from https://www.who.int/publications/i/item/9789241564823

WHO. (2018). *Good Hand Hygiene: A Simple, Cost-Effective Way to Save Lives and Transform the Quality of Health Care at All Levels*. Retrieved from www.who.int/southeastasia/news/opinion-editorials/detail/good-hand-hygiene-a-simple-cost-effective-way-to-save-lives-and-transform-the-quality-of-health-care-at-all-levels

WHO. (2020). *Guidelines on Physical Activity and Sedentary Behaviour*. Retrieved from https://www.who.int/publications/i/item/9789240015128

Won-Noh, J., Kim, J., Yang, Y., Park, J., Jooyoung, C., & Kwon, Y. D. (2017). Body Mass Index and Self-Rated Health in East Asian Countries: Comparison Among South Korea, China, Japan, and Taiwan. *Journal PLoS ONE*, *1*. https://doi.org/10.1371/journal. one.0183881

Yi, S. W., Ohrr, H., & Yi, J. J. (2015). Sex-Age-Specific Association of Body Mass Index with All-Cause Mortality Among 12.8 Million Korean Adults: A Prospective Cohort Study. *International Journal of Epidemiology*, *44*(5), 1696–1705. https://doi.org/10.1093/ije/dyv138

Zaitun, Z. (2024). Culinary Hygiene and Sanitation: A Systematic Literature Review. *Jurnal Penelitian Pendidikan IPA*, *10*(8), 598–605. https://doi.org/10.29303/jppipa.v10i8.8307