



Psychosocial Factors Associated with Fruit and Vegetable Consumption among Adults in Formal Employment

Irene Chikwekwete¹; Namo Gwisai¹; Reginald Dennis Gwisai²

¹Department of Food and Nutrition, Solusi University.

²Academic Department, Unicaf University Zimbabwe.

ARTICLE INFO

Article No.: 100520128

Type: Research

Accepted: 08/10/2020

Published: 04/03/2021

*Corresponding Author

Reginald Dennis Gwisai

E-mail: reginalddgwisai@yahoo.co.uk; r.gwisai@zimbabwe.unicaf.org

Keywords: Cues to action; fruits and vegetables; perceived barriers; perceived benefits

ABSTRACT

This study assessed psychosocial factors and their influence on intake of fruits and vegetables by 100 formal employees in five worksites of Harare. Their beliefs on perceived barriers, perceived benefits, and cues to action, as well as intake of fruits and vegetables, were obtained using a questionnaire. Overall, the respondents intake of fruits and vegetables was average ($M = 3.6$, $SD = 1.1$) which were eaten in different ways in particular vegetables as relish ($M = 4.1800$, $SD = .85$). Marital status groups differed significantly on perceived benefits ($p \leq 0.05$), perceived barriers ($p \leq 0.05$) and cues to action ($p \leq 0.05$) $F(2, 97) = 12.672$, $p \leq 0.05$. Level of nutrition knowledge for administrators ($p = 0.008$) and professionals ($p \leq 0.05$) differed significantly from general workers ($F(2, 27) = 3.754$, $p \leq 0.05$). Perceived benefits and cues to action predicted intake of fruits and vegetables ($F(2, 97) = 12.672$, $p \leq 0.05$). Based on these results employees in formal employment should be educated on benefits of fruits and vegetables so as to improve their intake.

INTRODUCTION

Despite the positive benefits and the existing nutrition guidelines studies have shown that consumption of fruits and vegetables is low as compared to the recommended daily intake in developing countries such as Zimbabwe (Siegel, 2019; Kabwama *et al.*, 2019; Seguin *et al.*, 2015; International Agency for Research on Cancer,

2013). It has been observed that most Zimbabweans took less than 5 servings of fruits and vegetables per day and compared to the set recommended guidelines in Zimbabwe and United Kingdom of 5 servings/portions per day (400grams/day), (Slavin and Lloyd, 2012; WHO, 2013; WHO, 2003). Similarly, in Zimbabwe the prevalence of Non Communicable Diseases (NCDs) and deaths associated with low intake of fruits and

vegetables was reported to be high (Katsidzira *et al.*, 2018; WHO, 2013). In spite of the enormous benefits and existing dietary recommendations, most Zimbabwean adults in Harare took less than five servings of fruits and vegetables per day (WHO, 2003). Previous studies recommend a minimum intake of 400g or five portions of fruits and vegetables per day for the prevention of prolonged diseases (such as heart diseases, cancer, diabetes, and obesity), (Zhai *et al.*, 2020; Katsidzira *et al.*, 2018; WHO, 2002; Hung, Joshipura and Jiang, 2004). Increasing fruits and vegetable intake should be the main objective in health promotion agendas and it is thus important to develop effective interventions to promote their intake (Gans *et al.*, 2018). In order to increase the potential effectiveness of such interventions, they should be tailored to the most important determinants of fruits and vegetable intake (Kongsbak *et al.*, 2016). The aim of this study was therefore to assess psychosocial factors of fruits and vegetable intake by adults in formal employment. Fruits and vegetables are an important component of a healthy human diet. They are highly recommended because of their health promoting properties (Gans *et al.*, 2018). They are a good source of vitamins, minerals, fiber and phytochemicals (Ugur, Gok, and Ugur, 2014). According to Layede and Adeoye (2014) vitamins and minerals such as potassium and folate are protective against chronic diseases and most specifically coronary heart diseases. Dietary fiber is important because it prevents constipation (Slavin and Lloyd, 2012). Fruits and vegetables are low in energy density, with few calories in relation to the volume consumed. This favours the maintenance of a healthy body weight (Ugur, Gok, and Ugur, 2014). The lower calories prevent weight gain and subsequently overweight and obesity (Hall, Moore, Harper, and Lynch, 2009).

Furthermore, fruits and vegetables have high phytochemicals and antioxidant contents (Oz and Kafkas, 2017; Slavin and Lloyd, 2012). In addition there is mounting evidence that eating fruits and vegetables appear to keep the brain young and may slow the mental decline associated with growing old (Williams, Wood, Collins, and Callister, 2015). Therefore, higher consumption level of fruits and vegetables has a strong correlation with quality of life and higher life expectancy (Gonzalez, 2011). Previous studies revealed that lower intake level of fruits and vegetables has a correlation with perceptions, nutrition knowledge and intake (Paquette, 2015). According to Stretcher and Rosenstock (1997) perceived benefits, perceived barriers and cues to action can be used to explain health behaviours. Therefore, the purpose of this study was to assess the psychosocial factors and intake of fruits and vegetables among adults. This information will help inform intervention strategies by responsible authorities in central, local government and the private sector. The factors of importance that need to be established are the nutrition knowledge levels, perceptions, perceived

barriers and consumption patterns on fruits and vegetables.

MATERIALS AND METHODS

A descriptive correlational design was used to assess psychosocial factors and the intake of fruits and vegetables by adults in formal employment (Gay, Mills and Alrosian, 2006). The population of the study comprised adults employed in different formal economic activities of the city of Harare Central Business District (CBD). Employees from the following economic activities as classified by the Central Statistical Office (CSO), (2014) were selected: - Retailers and Wholesalers, Financial intermediaries, Telecommunications, Hotel and Food service. Multi – stage probability sampling was used to select the economic activities and respondents to the study with the list of respondents being provided by management. A face to face and content validated questionnaire (100 participants) used for data collection consisted of a series of questions related to the Health Belief Model's constructs [e.g. perceived benefits, perceived barriers, cues to action and modifying factors (socio – demographic variables and nutrition knowledge)]. The section on nutrition knowledge assessed respondents' knowledge on nutrition value of fruits and vegetables (Deshpande *et al.*, 2009; Musaiger *et al.*, 2013). The Cronbach Alpha coefficient of 0.700 was obtained for the instrument and was observed to be reliable (Hair, Anderson and Black, 1998). Ethical approval was sort and granted and informed consent was obtained from the adults at each workplace. The collected data was analyzed with Statistical Package for the Social Science (SPSS) software version 20.0. Hence descriptive correlation test statistics were used to test the relationship among variables. Multiple stepwise regression was used to identify predictors of intake of fruits and vegetables.

RESULTS AND DISCUSSIONS

Table 1 shows socio – demographic characteristics of respondents. An equal number of males and females participated in the study. This was contrary to previous studies where females were more than males (Alia *et al.*, 2019; Seguin *et al.*, 2015; Nti *et al.*, 2011). Fifty – five percent of the respondents were single as compared to 45% of married participants which was contrary to previous studies (Alia *et al.*, 2019; Seguin *et al.*, 2015). The respondents with certificates and diplomas were more than those who had degrees which was similar to previous studies (Nti *et al.*, 2011), however some studies were contrary (Seguin *et al.*, 2015). Seventy – seven percent of respondents had administrative and professional jobs while 23% had general jobs.

Table 1: Demographic Characteristics of Respondents (n=100)

VARIABLES	CATEGORY	FREQUENCY	PERCENTAGE
Gender	Male	50	50
	Female	50	50
Age	18-25	21	21
	26-35	24	24
	36-45	28	28
	45-56	27	27
Marital Status	Single	55	55
	Married	45	45
Education	Primary and secondary	24	24
	Certificate and diploma	46	46
	First degree and above	30	30
Employment	General	23	23
	Administrative and Professional	77	77

Table 2 shows the level of nutrition knowledge of adults. The average mean of 3.77 showed that adults had moderate nutrition knowledge and were of limited variation in their responses with limited variation on the standard deviation (0.81). However, 94% of the respondents had little knowledge on the variable, number of servings of fruits and vegetables per day with

the mean of 2.38 and a standard deviation of 1.15. This is similar to previous studies where the relationship between nutrition knowledge and dietary practices is observed to be conflicting (Alia *et al.*, 2019; Dissen *et al.*, 2011; Wardle *et al.*, 2000; Spronk *et al.*, 2014; Nti *et al.*, 2011).

Table 2: Level of nutrition knowledge of adults (n=100)

VARIABLE QUESTIONS	PERCENTAGE RESPONSE					MEAN	STD. DEVIATION
	SD	D	NS	A	SA		
How many fruits per day are sufficient (Bananas, Oranges, Mazhanje, Matamba)	15	34	30	18	3	2.60	1.05
How many serving of fruits and vegetables are sufficient per day?	25	35	23	11	6	2.38	1.15
Fruits and vegetables are rich in the following: vitamins, fibre, minerals and phytochemicals	4	8	9	47	32	3.95	1.05
Scuvy, beriberi, are some of the deficiency diseases of low intake of fruits vegetables	3	10	24	43	20	3.67	1.01
Some of the diseases or health problems are associated with low intake of fruits and vegetables	YES (57)		NO (39)			3.83	1.47
The easiest way to get a variety of vitamins and minerals from fruits and vegetables is to vary their colours in the diet	5	12	22	39	22	3.59	1.12
Eating more fruits will reduce the suffering of diseases;- cancer, obesity.	3	10	8	48	31	3.89	1.14
If I do not eat a meal high in fiber I could have a problem of constipation	3	7	7	48	35	4.05	1.04
Some diseases and conditions may be increased by low intake of vegetables	3	8	9	48	32	3.99	0.92
If I do not eat recommended fruits I may suffer from Non communicable diseases such as diabetes , high blood pressure	6	15	21	40	18	3.41	1.08
A low intake of vegetables is unhealthy	2	7	8	49	35	4.08	1.05
Having a diet low in fruits would.....?	5	13	24	41	17	3.61	1.27
Having low intake of vegetables would affect my ability to go to work.	8	20	23	35	14	3.11	1.30
Low intake of fruits may increase some diseases and conditions that are difficult to cure.	3	7	8	48	34	4.00	4.10
AVERAGE						3.77	0.81

INTERPRETATION OF MEAN SCORE

SCALE	RESPONSE	MEAN INTERVAL	VERBAL INTERPRETATION
5	Strongly Agree	4.51 – 5.00	Very Knowledgeable
4	Agree	3.51 – 4.50	Knowledgeable
3	Not Sure	2.51 – 3.50	Slightly Knowledgeable
2	Disagree	1.51 – 2.50	Little Knowledge
1	Strongly Disagree	1.00 – 1.50	Not Knowledgeable at all

Table 3 shows the results of perceived benefits on fruits and vegetables intake. Overall, the respondents were positive that consuming fruits and vegetables would be beneficial to their health with a mean of 3.6483 and standard deviation of 0.60. This demonstrated that the respondents had moderate knowledge on the benefits of

eating fruits and vegetables and that they were homogenous in their responses. This is similar to previous studies on fruit and vegetable consumption in other age groups in the developed and developing world (Silva *et al.*, 2017; Gibson *et al.*, 1998).

Table 3: Perceived Benefits on the Intake of Fruits and Vegetables by Adults (n=100)

Fruits And Vegetables Intake	Agree	Disagree	Mean	Std. Deviation
I feel better and healthier if I eat more fruit in a meal.	5.00	3.07	4.04	0.97
I eat fruits because of their fiber content.	4.78	2.60	3.69	1.09
I eat vegetables because they are available	4.67	2.05	3.36	1.31
I eat fruits because they are cheap	4.83	1.97	3.40	1.43
I eat vegetables because of their nutritional value	4.83	2.07	3.45	1.38
Benefits Average			3.65	0.60
Valid N (list wise)				

INTERPRETATION OF MEAN SCORE

SCALE	RESPONSE	MEAN INTERVAL	VERBAL INTERPRETATION
2	Disagree	2.51 – 5.00	Positive
1	Agree	1.00 – 2.50	Negative

The results in Table 4 indicate that respondents cited family, followed by cost and lastly the belief that fruits and vegetables are for the sick as major barriers in descending order with means 3.25, 2.80 and 2.65 respectively. The respondents were heterogeneous with standard deviations of 1.42, 1.59, and 1.34 respectively.

Taste of these foods was not cited as a barrier indicating that most participants enjoyed their tastes. They were heterogeneous with standard deviations of 1.24 and 1.39 respectively. This is similar to studies elsewhere (Pem and Jeewon, 2015).

Table 4: Perceived Barriers on the Intake of Fruits and Vegetables by Adults (n=100)

Fruits and vegetables intake	A	Mean	Std. Deviation
Eating diet high in fruits is expensive	4.22	1.38	2.80
Vegetables lack nutritional value	3.60	1.12	2.36
Most fruits lack taste.	3.75	0.97	2.36
Fruits are eaten when one is sick.	4.24	1.06	2.65
My family would not like the changes in my diet if I tried to eat more vegetables.	4.59	1.91	3.25
Barrier average		2.68	0.97
Valid N (list wise)			

INTERPRETATION OF MEAN SCORE			
SCALE	RESPONSE	MEAN INTERVAL	VERBAL INTERPRETATION
2	Strongly Agree(SA)	2.51 – 5.00	Positive
1	Agree(A)	1.00 – 2.50	Negative

The overall mean of 4.26 showed that participants are very much prepared to change their behaviour by certain cues to action (See table 5). However the standard deviation of 1.45 showed that respondents differed in their responses. The most preferred cues to action were health experts, followed by having an orchard at home and reading pamphlets $m = 4.76$, $m = 4.26$, $m = 4.03$ respectively. The standard deviation for reading

pamphlets and having an orchard at home were 0.98 and 0.89 respectively showing that the adults were homogenous in their responses. With regard to health messages expert adults differed in their responses ($m = 5.14$). Overall, the respondents were highly motivated to eat fruits and vegetables by cues such as health expert's messages, orchards and gardens at homes. This is similar to other studies elsewhere (Gans *et al.*, 2018).

Table 5: Fruits and Vegetable Consumption related Cues to Action (n=100)

Fruits and vegetables intake	SA	A	Mean	Std. Deviation
Encouraging adverts from media would help me to eat more vegetables	5.00	2.92	3.98	1.06
Reading pamphlets with colourful fruit pictures would help me eat more fruits	5.00	3.04	4.03	0.99
Health message from Health experts about benefits of vegetables would help me to include them in my diet	10.0	0.00	4.76	5.14
Having an orchard at my home would help me to eat more fruits	5.00	3.36	4.26	0.90
Cues to action average			4.26	1.45
Valid N (list wise)				

INTERPRETATION OF MEAN SCORE			
SCALE	RESPONSE	MEAN INTERVAL	VERBAL INTERPRETATION
2	Strongly Agree	2.51 – 5.00	Preferred
1	Agree	1.00 – 2.50	Not preferred

One-way analysis of variance (ANOVA) was used to determine whether there were any statistically significant differences between the means of socio – demographic characteristics of adults and psychosocial factors. With respect to marital status the results showed a statistical significant difference between the married and the single on perceived benefits ($p \leq 0.05$), perceived barriers ($p \leq 0.001$) and cues to action ($p \leq 0.05$). However there were no significant differences on nutrition knowledge and dietary practices between the groups. Post Hoc Tests revealed that married respondents perceived fruits and vegetables as beneficial more than the divorced and the single. The divorced scored higher on benefits than the separated. While the married and single had fewer barriers than the divorced and the widows. The single respondents were more familiar with the cues than those who were married. This is similar to observations on studies observed elsewhere on mothers and children (Gibson *et al.*, 1998). To examine whether there was a significant difference between employment status and psychosocial factors one way ANOVA was used. The

results showed that there was a statistically significant difference in nutrition knowledge between groups as determined by one way ANOVA ($F(2,27) = 3.754$, $p \leq 0.05$). However there was no significant difference on perceived benefits and barriers, cues to action as well as dietary practices. Post hoc analysis showed that the administrators and professionals had better knowledge on nutrition than general workers. This has been observed to be similar to previous studies elsewhere (Hakli *et al.*, 2016). Stepwise multiple regressions were used so as to find the best combination of independent predictor variables that could predict vegetable and fruit eating patterns by adults. The stepwise variable selection method identified the variables perceived benefits and cues to action. The model was statistically significant $F(2, 97) = 12.672$, $p \leq 0.001$. It accounted for approximately 21% of the variance (coefficient of determination) of eating patterns of fruits and vegetables ($R^2 = 21\%$, Adjusted $R^2 = 19.1\%$).

CONCLUSION

This study managed to identify determinants of fruits and vegetable intake among adults in formal employment. The most important determinants of intake as identified by regression were perceived benefits and cues to action. According to the Health Belief Model, people tend to accept health behaviour when they consider the new behaviour will decrease their chance of illness (Rosenstock, 1974). Several previous studies have also found that perceived benefits was a good predictor of fruit and vegetable intake (Katsidzira *et al.*, 2018; Resnicow, Jackson, Wang, and De, 2001; Steptoe, Perkin-Porras and McKay, 2003). These studies demonstrated a positive and significant correlation between the perceived benefits and the consumption of fruits and vegetables in the subjects surveyed (Gans *et al.*, 2018). Thus, healthcare providers and experts can design health promoting educational intervention programmes to increase the understanding of healthy nutritional benefits of fruits and vegetables and subsequently change not only adult behaviour, but the behaviour of all the people in the society (Hakli *et al.*, 2016). With respect to cues to action they activated one's readiness, promote awareness and employ a system of reminders for those interested in changing behaviour (Hakli *et al.*, 2016; Rosenstock, 1974). Participants in this study agreed that they would be more likely to attempt fruit and vegetable intake if experts recommended, having an orchard at home, reading pamphlets and media promotions. This is similar to the observations of other studies elsewhere (Gans *et al.*, 2018). It is essential that interventions use health experts in educating the public so that people can learn the correct information. If health experts are actively involved in disseminating health messages this will help clear misconceptions such as fruits and vegetables are for sick people. In conclusion the results of this study showed that perceived benefits of healthy nutrition of fruit and vegetables as well as cues to action strengthen healthy eating behaviour in adults and thus these factors should be considered by public health in the country in any future intervention programmes.

DATA AVAILABILITY

The data used to support the findings of this study are available from the corresponding author upon request.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

FUNDING STATEMENT

The study was funding from the authors resources

REFERENCES

- Al-Otaibi, H. H. (2014). The pattern of fruit and vegetable consumption among Saudi university students. *Global Journal of Health Science*, 6(2), 155–62. Retrieved from <https://doi.org/10.5539/gjhs.v6n2p155>
- Arganini, C., Anna, S., Comitato, R., Fabio, V., and Turrini, A. (2012). Gender differences in food choice and dietary intake in modern Western societies. *Public Health: Social and Behavioral Health*, 83–102. Retrived from <https://doi.org/10.5772/2242>
- Ball, K., Lamb, K. E., Costa, C., De, A. K., Ellaway, A., Kamphuis, C. B. M., ... Zenk, S. N. (2015). Neighbourhood socioeconomic disadvantage and fruit and vegetable consumption: a seven countries comparison. *The International Journal of Behavioral Nutrition and Physical Activity*, 12, 68. Retrived from <https://doi.org/10.1186/s12966-015-0229-x>
- Bogdanovich, V. (2013). Self-Determination Motivation and Perceived Barriers in the Vegetable Eating Context.
- Conklin, A. I., Forouhi, N. G., Suhrcke, M., Surtees, P., Wareham, N. J., and Monsivais, P. (2014). Variety more than the quantity of fruit and vegetable intake varies by socioeconomic status and financial hardship. Findings from older adults in the EPIC cohort. *Appetite*, 83, 248–255. Retrieved from <https://doi.org/10.1016/j.appet.2014.08.038>
- Deshpande, S., Basil, M. D., and Basil, D. Z. (2009). Factors Influencing Healthy Eating Habits Among College Students: An Application of the Health Belief Model. *Health Marketing Quarterly*, 26(2), 145–164. Retrieved from <https://doi.org/10.1080/07359680802619834>
- Dinner am, Y., and Jeewon, R. (2013). A scientific assessment of sociodemographic factors, physical activity level, and nutritional knowledge as determinants of dietary quality among indo-Mauritian women. *Journal of Nutrition and Metabolism*, 2013. Retrieved from <https://doi.org/10.1155/2013/572132>
- Emanuel, A. S., McCully, S. N., Gallagher, K. M., and Updegraff, J. A. (2012). Theory of Planned Behavior Explains Gender Difference in Fruit and Vegetable Consumption. *Appetite*, 59(3), 693–697. Retrieved from <https://doi.org/10.1016/j.appet.2012.08.007>.Theory
- Figueiredo, I. C., Jaime, P. C., and Monteiro, C. A. (2008). Factors associated with fruit and vegetable intake among adults sof the city of Sao Paulo, Southeastern Brazil. *Rev Saude Publica*, 42(5), 777–785. Retrieved from <https://doi.org/S0034-89102008005000049> [pii].
- Gans, K.M., Risica, P.M., Keita, A.K., Dionne, L., Mello, J., Stowers, K.C., Papandonatos, G., Whittaker, S., and Gorham, G. (2018). Multilevel Approaches to increase Fruit and Vegetable Intake in Low-Income Housing Communities: Final Results of the Live

- Well, Viva Bien' Cluster – Randomised Trial. *International Journal of Behavioural Nutrition and Physical Activity*, 15(80), 1 – 18.
- Gibson, E.L., Wardle, J., and Watts, C.J. (1998). Fruit and Vegetable Consumption, Nutritional Knowledge and Beliefs in Mothers and Children. *Appetite*, 31(2), 205 – 228. doi:10.1006/appe.1998.0180.
- Hakli, G., Asil, E., Ucar, A., Ozdogan, Y., Yilmaz, M.V., Ozcelik, A.O., Surucuoglu, M.S., Cakiroglu, F.P., and Akan, L.S. (2016). Nutritional Knowledge and Behaviour of Adults: Their Relations with Socio – demographics Factors. *Pakistan Journal of Nutrition*, 15(6), 532 – 539. DOI: 10.3923/pjn.2016.532.539.
- Hall, J. N., Moore, S., Harper, S. B., and Lynch, J. W. (2009). Global Variability in Fruit and Vegetable Consumption. *American Journal of Preventive Medicine*, 36(5), 402–409.e5. <https://doi.org/10.1016/j.amepre.2009.01.029>
- Hung, H. C., Joshupura, K. J., Jiang, R., Hu, F. B., Hunter, D., Smith-Warner, S. A., ... Willett, W. C. (2004). Fruit and vegetable intake and risk of major chronic disease. *Journal of the National Cancer Institute*, 96(21), 1577–1584. Retrieved from <https://doi.org/10.1093/jnci/djh296>
- Jacobson Vann, J. C., Finkle, J., Ammerman, A., Wegner, S., Skinner, A. C., Benjamin, J. T., and Perrin, E. M. (2011). Use of a tool to determine perceived barriers to children's healthy eating and physical activity and relationships to health behaviors. *Journal of Pediatric Nursing*, 26(5), 404–415. Retrieved from <https://doi.org/10.1016/j.pedn.2010.10.011>
- John, J. H., and Ziebland, S. (2004). Reported barriers to eating more fruit and vegetables before and after participation in a randomized controlled trial: A qualitative study. *Health Education Research*, 19(2), 165–174. Retrieved from <https://doi.org/10.1093/her/cyq016>.
- Kabwama, S.N., Bahendeka, S.K., Wesonga, R., Mutungi, G., and Guwatudee, D. (2019). Low Consumption of Fruits and Vegetables among adults in Uganda: Findings from a countrywide cross sectional survey. *Archives of Public Health*, 77(4), 1 – 8. <https://doi.org/10.1186/s13690-0332-6>.
- Katsidzira, L., Laubscher, R., Gangaidzo, I.T., Swart, R., Makunike – Mutasa, R., Manyanga, T., Thomson, S., Ramesar, R., Matenga, J.A., and Rusakaniko, S. (2018). Dietary Patterns and Colorectal Cancer Risk in Zimbabwe: A Population based Case – Control Study. *Cancer Epidemiology*, 57, 33 – 38. doi:10.1016/j.canep.2018.09.005.
- Kongsbak, I., Skov, L. R., Nielsen, B. K., Ahlmann, F.K., Schaldemose, H., Atkinson, L., Wichmann, M., Perez –Cueto, F.J.A. (2016). Increasing Fruit and Vegetable Intake among Male University Students in an ad libitum buffet Setting: A Choice Architectural Nudge Intervention. *Food Quality and Preference*, 49, 183 – 188.
- Kpodo, F. M., Mensah, C., and Dzah, C. S. (2015). Fruit and Vegetable Consumption Patterns and Preferences of Students in a Ghanaian Polytechnic. *World Journal of Nutrition and Health*, 3(3), 53–59. Retrieved from <https://doi.org/10.12691/jnh-3-3-2>.
- Layede, A. A., and Adeoye, I. B. (2014). Fruit and vegetable consumption among students of tertiary institutions in Oyo state. *International Information Systems for Agricultural Science and Technology*, 6(June), 3–8.
- Miller, V., Yusuf, S., Chow, C. K., Dehghan, M., Corsi, D. J., Lock, K., and Mente, A. (2016). Availability, affordability, and consumption of fruits and vegetables in 18 countries across income levels: findings from the Prospective Urban Rural Epidemiology (PURE) study. *The Lancet. Global Health*, 695–703. Retrieved from [https://doi.org/10.1016/S2214-109X\(16\)30186-3](https://doi.org/10.1016/S2214-109X(16)30186-3)
- Musaiger, A. O., Al-Mannai, M., Tayyem, R., Al-Lalla, O., Ali, E. Y. a., Kalam, F., and Chirane, M. (2013). Perceived Barriers to Healthy Eating and Physical Activity among Adolescents in Seven Arab Countries: A Cross-Cultural Study, *The Scientific World Journal*, 2013, e232164. Retrieved from <https://doi.org/10.1155/2013/232164>, 10.1155/2013/232164
- Musaiger, A. O., Al-Mannai, M., Tayyem, R., Al-Lalla, O., Ali, E. Y. A., Kalam, F., and Chirane, M. (2013). Perceived barriers to healthy eating and physical activity among adolescents in seven Arab countries: a cross-cultural study. *The Scientific World Journal*, 2013, Article-232164. Retrieved from <http://www.hindawi.com/journals/tswj/2013/232164/>
- Naghashpour, M., Shakerinejad, G., and Lourizadeh, Mohammad Reza, Hajinajaf Saeedeh, J. F. (2014). Nutrition Education Based on Health Belief Model Improves Dietary Calcium Intake among Female Students of Junior High Schools. *Journal Of Health, Population, And Nutrition*, 32(3), 420–429.
- Oz, A.T., and Kafkas, E. (2017). Phytochemicals in Fruits and Vegetables. Super Foods and Functional Food:- An Overview of their Processing and Utilisation. DOI:10.5772/66987.
- Pem, D., and Jeewon, R. (2015). Fruit and Vegetable Intake: Benefits and Progress of Nutrition Education Interventions – Narrative Review Article. *Iranian Journal of Public Health*, 44(10), 1309 – 1321.
- Prättälä, R., Paalanen, L., Grinberga, D., Helasoja, V., Kasmel, A., and Petkeviciene, J. (2007). Gender differences in the consumption of meat, fruit and vegetables are similar in Finland and the Baltic countries. *European Journal of Public Health*, 17(5), 520–525. Retrieved from <https://doi.org/10.1093/eurpub/ckl265>
- Resnicow, K., Jackson, A., Wang, T., and De, A. K. (2001). A motivational interviewing intervention to increase fruit and vegetable intake *Nutrition Journal* Retrieved from, 91(10), 1686–1693.
- Salehi, L., Eftekhari, H., Mohammad, K., Tavafian, S. S.,

- Jazayeri, A., and Montazeri, A. (2010). Consumption of fruit and vegetables among elderly people: a cross sectional study from Iran. *Nutrition Journal*, 9(1), 2. Retrieved from <https://doi.org/10.1186/1475-2891-9-2>.
- Siegel, K.R. (2019). Insufficient Consumption of Fruits and Vegetables among Individuals 15 Years and Older in 28 Low – and Middle – Income Countries: What Can Be Done? *The Journal of Nutrition*, 149(7), 1105 – 1106. <https://doi.org/10.1093/jn/nxz123>.
- Silva, O.O., Ayangogbe, O.O., and Odugbemi, T.O. (2017). Knowledge and Consumption of Fruits and Vegetables among Secondary School Students of Obele Community Junior High School, Surulele, Lagos State, Nigeria. *Journal of Clinical Sciences*, 14(2), 68 – 73.
- Slavin, J., and Lloyd, B. (2012). Health Benefits of Fruits and Vegetables. *Advances in Nutrition*, 3(4), 506–516. Retrieved from <https://doi.org/10.3945/an.112.002154.506>.
- Step toe, A., Perkins-Porras, L., McKay, C., Rink, E., Hilton, S., and Cappuccio, F. P. (2003). Psychological factors associated with fruit and vegetable intake and with biomarkers in adults from a low-income neighborhood. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, 22(2), 148–155. Retrieved from <https://doi.org/10.1037/0278-6133.22.2.148>.
- Stretcher, V., and Rosenstock, I. M. (1997). The Health Belief Model. *Health Behavior and Health Education: Theory, Research and Practice*, 31–36. Retrieved from <https://doi.org/10.1111/j.1365-2648.2010.05450.x>
- Tavassoli, E., Reisi, M., Javadzad, S. H., Gharli Pour, Z. G., Gilasi, H. R., Ghasemi, S., and Hafez, A. A. (2014). The effect of education on the improvement of fruits and vegetable consumption aiming to preventing colorectal cancer. *Gastroenterology and Hepatology from Bed to Bench*, 7(2), 94–100.
- Ugur, A., Gok, Y., and Ugur, H. G. O. K. (2014). Impact of socio-cultural and economic factors on vegetable consumption behaviours: the case of Giresun Province, Turkey. *Food Science and Technology Campinas*, 34(4), 688–693. <https://doi.org/10.1590/1678-457X.6401>
- Wang, X., Ouyang, Y., Liu, J., Zhu, M., Zhao, G., Bao, W., and Hu, F. B. (2014). Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. *Bmj*, 349(jul29 3), g4490–g4490. Retrieved from <https://doi.org/10.1136/bmj.g4490>
- World Health Organisation (2003). Diet. Nutrition and the prevention of Chronic Diseases. *Report of a joint WHO/FAO Expert consultation. WHO Technical Report Series Number 916 Geneva*. (n.d.).
- World Health Organisation. (2002). World Health Organisation Global Strategy on Diet, Physical Activity and Health, *Promoting Fruits and Vegetables Consumption Around the World*. Geneva.
- Williams, R. L., Wood, L. G., Collins, C. E., and Callister, R. (2015). Comparison of fruit and vegetable intakes during weight loss in males and females. *European Journal of Clinical Nutrition*, 70(1), 28–34. Retrieved from <https://doi.org/10.1038/ejcn.2015.123>
- Yeh, M. C., Ickes, S. B., Lowenstein, L. M., Shuval, K., Ammerman, A. S., Farris, R., and Katz, D. L. (2008). Understanding barriers and facilitators of fruit and vegetable consumption among a diverse multi-ethnic population in the USA. *Health Promotion International*, 23(1), 42–51. Retrieved from <https://doi.org/10.1093/heapro/dam044>
- Zhai, H., Wang, Y., and Jiang, W. (2019). Fruit and Vegetable Intake and the Risk of Chronic Obstructive Pulmonary Disease: A Dose – Response Meta – Analysis of Observational Studies. *BioMed Research International, Volume 2020*, 1 – 12. <https://doi.org/10.1155/2020/3783481>
- Senguin, R.A., Aggarwal, A., Vermeylen, F., and Drownowski, A. (2015). Consumption Frequency of Foods Away from Home Linked with Higher Body Mass Index and Lower Fruit and Vegetable Intake among Adults: A Cross – Sectional Study. *Journal of Environmental and Public Health, Volume 2016*, 1 – 12. DOI: [10.1155/2016/3074241](https://doi.org/10.1155/2016/3074241)
- Dissen, A. R., Policastro, P., Quick, V., and Byrd – Bredbenner, C. (2011). Inter relationships among Nutrition Knowledge Attitudes, Behaviours and Body Satisfaction. *Health Education*, 111(4), 283 – 295.
- Wardle, J., Parmenter, K., and Waller, J. (2000). Nutrition Knowledge and Food Intake. *Appetite*, 34(3), 269 – 275.
- Sprong, I., Kullen, C., Burdon, C., and O'Connor, H. (2014). Relationship between Nutrition Knowledge and Dietary Intake. *British Journal of Nutrition*, 111(10), 1713 – 1726.