Qualitative Study of Barriers in Adopting a Healthy Diet and Lifestyle Among Kadazandusun Community with Nasopharyngeal Carcinoma in Sabah

Raja Muhammad Raja Omar[*], Che wan Ilmiyah[**], Fredie Robinson [**], Haryati Abdul Karim [***]

[*] Otorhinolaryngology Department of Hospital Queen Elizabeth Kota Kinabalu Sabah. Malaysia
[**] Community & Family Medicine Department, Faculty of Medicine and Health Sciences, UMS, Jalan UMS, 88400, Kota Kinabalu, Sabah, Malaysia
[***]Faculty of Social Science and Humanities University Malaysia Sabah Jalan UMS, 88400, Kota Kinabalu, Sabah, Malaysia

DOI: 10.29322/IJSRP.12.10.2022.p13067
http://dx.doi.org/10.29322/IJSRP.12.10.2022.p13067

Paper Received Date: 14th September 2022
Paper Acceptance Date: 15th October 2022
Paper Publication Date: 21st October 2022

Abstract- Nasopharyngeal carcinoma is uncommon cancer. However, it is the most prevalent cancer among Sabah indigenous, particularly those from Kadazan and Dusun ethnic groups. This ethnicity contributes to more than half of all nasopharyngeal cancer diagnoses between 2012 and 2016. Despite a health program and screenings, this malignancy remained steadily high among the ethnicity throughout the year. This study explores the barriers to adopting a healthy lifestyle in terms of diet practices and risky behavior with nasopharyngeal carcinoma among the Kadazandusun ethnicity in Sabah. Four focus groups discussion were conducted with in-depth interviews from three separate district locations to get the information. Results: Three barriers were identified that prevent Kadazandusun from adopting a healthy diet and lifestyle, level of understanding, individual acceptance, and cultural pressure. In conclusion, understanding the barriers to adopt a healthy lifestyle would aid in appropriately creating health programs or relevant linked policies to help lower this malignancy among the target groups involved.

Index Terms- Barriers, Diet, Lifestyle, Nasopharyngeal Carcinoma, Qualitative Study

I. INTRODUCTION

Nasopharyngeal carcinoma (NPC) causes a significant health burden in Malaysia; it ranked number fifth (4%) among all cancer most commonly diagnosed in the population [1]. From 2012 to 2016, 4,597 cases of NPC were reported, compared to 5,090 patients in the previous study from 2007 to 2011[2]. Kadazan and Dusun ethnicity are most affected by this malignancy[3] with the average age-standardized (ASR) rate of nasopharyngeal carcinoma in Sabah being 7.9 per 100,000. Dusun ethnic was found to have the highest ASR individuals, 3.19 per 100,000 in males and 1.69 per 100,000 in females, with a 2.4 ratio between male-to-females followed by Chinese and Kadazan [4]. The rise in NPC cases puts pressure on Malaysia's medical costs [5]. This burden occurs because Malaysia has subsidized medical expenses, including cancer treatment [5]. Many scholars claim that nasopharyngeal carcinoma is associated with diet and lifestyle. According to [6]–[9], salted and grilled fish, and pickled food are associated with NPC as well as smoking and alcohol drinking[10]. Besides that, genetics and Epstein Barr Virus are non-modifiable risk factors related to NPC.

Kadazandusun is the largest ethnic group in Sabah, with 698,300 people accounting for 18% of the Sabah population in 2021 [11]. They live on the western shore and in the countryside surrounding the coast of Sabah. As the dominant race, Kadazandusun is well-known for its diverse social culture and tradition, including diet. Apart from symbolizing spirituality and emotions, this culture and tradition also give social groups characteristics [12]. Kadazandusun is also known for its heavy reliance on alcohol. These diverse cultures and practices have been passed down from one generation to another [13].

Food preparation by utilizing salty techniques to keep food from fast and permanently deteriorating is a storage method practiced by this ethnic [14]. This technique results in a more significant number of health issues, as salt reduction is important to prevent hypertension and cardiovascular disease [15]. This assertion is comparable to the finding, pickles had become Kadazandusun's preferred food [16]. This diet is an appetizer and a most popular diet than other traditional food.

Consumption of this food increases the risk of developing NPC [9] and esophageal cancer [17]. One example of salty food is salted fish. According to [6], this food has associated with NPC. This salted fish contained nitrosamines that are formed during the manufacturing process [18]. The International Agency for Research on Cancer, this nitrosamine is a human mutagenic carcinogen.

Kadazandusun also likes to eat smoked food, known locally as "bakas." This diet increases the risk to NPC through the carbon created during its preparation combustion process, known as polycyclic aromatic hydrocarbons (PAH). These chemicals are related to NPC [19]

and breast cancer [20]. Drinking alcohol is part of Kadazandusun culture. One of the reasons because alcohol is quickly gained due to self-made [21]. According to [21], [22] this activity is quite worrying, especially among young children. The sadder effect is seen more during festival Kaamatan when many people drunken or fights due to excessive drinking. This alcohol has associated with NPC, and liver disease and slows down the rate of nutrient absorption [10], [23], [24].

Kadazandusun community, who lives in the interior used rolled cigarettes because it is cheap and easy to obtain. This hand-rolled cigarette smoking causes DNA damage and oxidation of plasma protein significantly higher than in filter-cigarette smokers [25]. Anyhow, both types of cigarettes can cause lung cancer and NPC [10].

II. RESEARCH METHODOLOGY

This qualitative study uses focus group discussion (FGD) and in-depth interviews with a semi-structured questionnaire. Purposive and snowball sampling methods were applied for sample selection. Four focus groups were recruited from three districts in Sabah. Inclusion criteria were age between 17-70 years old, not being a cancer patient, or having a family with cancer. Meanwhile, the exclusion criteria were respondents with pregnancy. Interviews were conducted between November 2021 and December 2021. The time spent on each interview varied from half an hour to 45 minutes. Each interview takes an average of 36 minutes to collect all relevant information, and data saturation was achieved after four group discussions with 17 respondents.

Written consent is taken before each interview, and respondents were told about the study contents and assured of ethical norms such as anonymity and confidentiality. Open questions were used to gather information on barriers to adopting a healthy diet and lifestyle. Each respondent was allowed to provide all the relevant information. All session was recorded, the video recording was de-identified, and personally-identifying information was not mentioned.

Semi-structured interviews consist of 4 to 6 persons in each focus group session. An in-depth interview is done to get a better and more detailed description of the information. Below is the question used.

a) What is the favorite food among the Kadazandusun, and state how often the food is taken?
b) In your opinion, can this diet increase the risk of nasopharyngeal cancer among Kadazandusun?
c) Have you ever heard that consuming fermented food and alcohol may increase the risk of nasopharyngeal cancer?
d) Can you tell me what barriers keep you from quitting this risky activity?

From the information given, open coding and thematics were identified and analyzed, as suggested by Braun and Clarke [26]. All the data was gathered and analyzed using a conventional content analysis method with qualitative data experts to understand differences in perspectives within the ethnic group about their diet and lifestyle.

This study was carried out according to the ethical precepts of the Declaration of Helsinki and the Good Clinical Practice Guidelines, with permission Ministry of Health Medical Research and Ethics Committee.

III. RESULT

This study involved 17 respondents from three locations. The mean age of participants was 41.47 years. Nine female and eight male participants with seven of them having higher education. Three have primary and seven with secondary education. The majority of them were married. The demographic shows two participants have incomes below RM 1200, seven of them have incomes that fall between RM 1200 and RM 2400, and the remaining eight participants have more than RM 2400 per month, as shown in Table 1.

Table 1: Demographic Characteristics of Participants

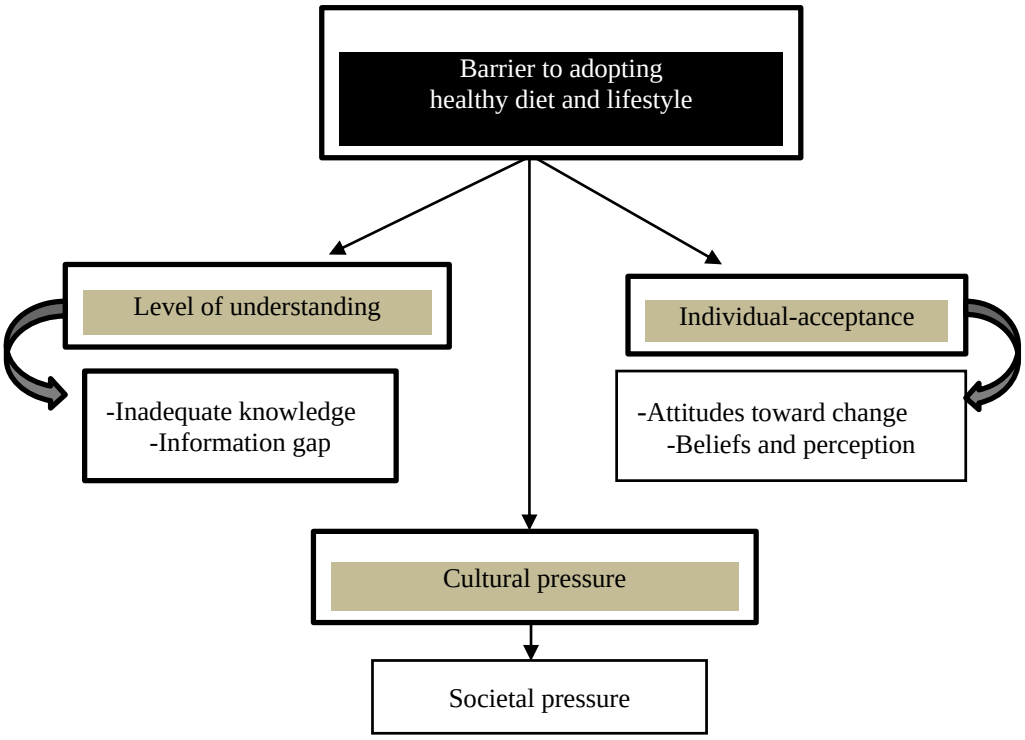
	Ethnic	Location	Gender	Age	Education	Income	Marital status
A.	Dusun	Keningau	Female	54	Primary school	<RM 1200	Married
B.	Dusun	Keningau	Male	44	Secondary School	RM 1200-2400	Married
C.	Kadazan	Penampang	Female	36	Higher education	RM 1200-2400	Married
D.	Dusun	Penampang	Male	35	Secondary School	RM 1200-2400	Married
E.	Dusun	Keningau	Female	28	Primary school	<RM 1200	Single
F.	Kadazan	Kota Kinabalu	Female	48	Higher education	>RM 2400	Married
G.	Dusun	Keningau	Male	30	Higher education	>RM 2400	Married
H.	Dusun	Keningau	Male	34	Higher education	RM 1200-2400	Married
I.	Kadazan	Penampang	Male	44	Secondary School	RM 1200-2400	Married
J.	Dusun	Keningau	Female	56	Primary school	RM 1200-2400	Married
K.	Kadazan	Penampang	Female	50	Secondary School	>RM 2400	Married
L.	Dusun	Keningau	Female	48	Higher education	>RM 2400	Married
M.	Kadazan	Keningau	Female	36	Secondary School	>RM 2400	Married
N.	Dusun	Keningau	Male	44	Higher education	>RM 2400	Married
O.	Kadazan	Penampang	Female	40	Higher education	>RM 2400	Married
P.	Kadazan	Kota Kinabalu	Male	44	Secondary School	RM 1200-2400	Married

Q.	Kadazan	Kota Kinabalu	Male	34	Secondary School	>RM 2400	Married

3. Barriers To Adopting Healthy Diet and Lifestyle

Level of understanding, individual acceptance, and cultural pressure are the three main themes barrier prevents this ethnicity from adopting a healthy diet and lifestyle. Under the main themes, there were two subthemes related as illustrated in figure 1.

Figure 1: The Relationship between Themes (Grey Boxes) and Subthemes (White Boxes) the Barrier of Kadazandusun to Adopting a Healthy Diet and Lifestyle.



3.1 Level of understanding theme

Inadequate knowledge and information gap have been assigned to these subthemes. These subthemes inferred the meaning level of understanding and importance of a healthy lifestyle and behavior in their daily activities, which contributed to the emergence of this problem. The possible reason for this is that a health program that warns of the health risk of an unhealthy diet and lifestyle, which can lead to NPC, does not reach the target group because they live in the interior and rural areas. The information presented above can be summed up in the sentence below.

“They have been consuming a particular dish for quite some time. every person in the village consumes this meal, but I have never heard of anyone in the area contracting this illness, and I am unsure whether it can cause health problems.” (Person: D).

“I've heard of this disease, but I'm not sure what causes it..." (Person: E)

There are also statements from them referring to inadequate knowledge because thinking tapai is safer than factory-made alcoholic beverages.

"For me, drinking this tapai is better than drinking alcoholic beverages purchased at a store. It is safer because we made it ourselves and we know it's clean and the mixture as opposed to being made in a factory, mixed with chemicals and not natural" (Person: I)

Information gap statement:

"I've never heard of it, and I rarely hear of this illness.'" (Person: J)

"I heard something, but is it true that pickled or salted food causes it? "(Person: L)

“I’m not familiar with this disease.” (Person: M)

According to the statement above, they have insufficient knowledge and information about the food consumed and the consequences of drinking tapai. The NPC incidence can be reduced if the factors mentioned above are effectively addressed.

3.2 Individual acceptance's theme

Individual acceptance is the second theme identified. The attitude toward change, belief, and perception of the importance of healthy food intake and lifestyle were two subthemes extracted from FGD. Kadazandusun believed their diet was healthy because they

had been exposed since childhood, and everyone in their surroundings was practicing it.
The findings obtained are as follows:
Belief and perception
"For me, the food is good for health as there are no chemicals and no fertilizer. People in the past, they live longer than the current generation... even hundreds of years." (Person: A)
"Drinking is not to get drunk, maybe just to warm the body, like in Tambunan. It's a cold place, so if you drink, you will feel more comfortable." (Person: K)
Attitude towards change:
"I am aware that it is not a healthy beverage... but if you drink just a little bit, it encourages you to work hard" (Person: A)
"Drinking already become our tradition, many people practice it, even though they know that drinking is not good" (Person: C)

3.3 Cultural pressure theme

Kadazandusun ethnicity has its own unique culture. It's a delight and a source of pride for them to have food such as bosou, hinava, and many others including homemade alcohol called tapai. Their community accepts this food as their culture and tradition such as serving this food and alcohol to guests or giving alcohol to those in attendance. As a result, those who desire to improve to healthy diet and lifestyle will face social pressure. It requires them to eat or drink what is given to caring for the feelings of the house owners and friends.
Societal pressure statement:
"At our place, everyone will drink, regardless of religion. If they don't drink, they will be said to be arrogant". (Person: B)
"It is difficult to stop this activity because it is already a tradition and accepted by the community. For me, it is better to take care of my parent's and the villagers' feelings. If I don't drink, it will make them feel bad for us, so I have to drink even a little" (Person: H)
"This tapai is frequently offered to respect the guests... it has become a tradition among people in kadazandusun." (Person: I)
“Every function, we served tapai; it has been a practice and tradition for me since I was a child. Especially at weddings ceremonies and funerals." (Person: H)

IV. DISCUSSION

The increased incidence of nasopharyngeal cancer over the last five years, with the trend of this disease being identified at a younger age among this ethnicity, is quite concerning. As stated by [9], [27], [28], moving to a better diet and avoiding a dangerous lifestyle can assist this community in living healthier and minimizing the risk of NPC.

4.1 Level of Understanding

Understanding of disease risk factors involved is crucial to maintaining individual health status. By avoiding specific foods or engaging in a risky lifestyle, this community can reduce its chances of having nasopharyngeal cancer. According to [29], this is one of the reasons why Singapore's problem with the liver disease continues to exist despite efforts to regulate and treat it. The study noticed that the population of Singaporeans had a poor understanding of the liver disease. This opinion is backed by (35), as he concluded that when evaluating the connections between health literacy, disease-specific knowledge, and disease awareness among patients with chronic kidney disease (CKD) in Taiwan. The individuals with CKD who were aware of and understood their condition did better in the evaluation.

Raising awareness is an important step before any program can be implemented to solve the problems. Awareness programs short and long-term should be continued to improve nasopharyngeal carcinoma knowledge [27]. Insufficient knowledge also affects a person's understanding of the risk factors of a disease. According to a study conducted by [30], a high percentage of women (50%) were unaware of breast cancer risk factors even though it is a common type of cancer among women, whereas 42% of women believed long-term contraceptive use was a risk factor. This outcome illustrates that there is still a lack of essential awareness regarding the risks linked with common cancer. However, the situation may be much direr for nasopharyngeal carcinoma as it is uncommon cancer.

Knowledge plays a vital role especially in practicing a healthy lifestyle, whereas inadequate knowledge will be exposed to many problems, as discussed by [31]. This finding is also parallel with [32] in comparison to healthy people, who found patients have poorer awareness of pathology, symptoms, prevention and treatment, and risk factors.

In addition, it is necessary to narrow the information gap that exists between the rural population. This situation had structural limitations, such as a lack of specialists and limited media exposure, making it more difficult for rural areas to receive health information, particularly those with a low health literacy level[33]. According to [34], the information gap needs to be addressed carefully so that every piece of information can be conveyed accurately to the desired target population.

4.2 Individual Acceptance

Individual acceptance was the second theme seen as a barrier for the Kadazandusun community to adopt a healthy lifestyle. At the same time, attitudes toward change, beliefs, and perceptions are sub-themes under this umbrella. According to research carried out by [35], a lack of willpower may influence an individual's attitude toward the need for change. Furthermore, the belief that taking risks is just a normal part of life can make a person less open to positive change and may worsen the condition [36]. This belief can be seen in drinking tapai, this race believes that drinking tapai is a regular practice for them, even though it is unhealthy activity. They claimed it contains natural ingredients and does not contain chemicals like other alcoholic beverages. As a result of belief, Ghanaian society faces

challenges in adopting a healthier diet; as explained by [37], individual experiences, family dynamics, and community factors all shape people's beliefs on healthy and unhealthy eating habits.

However, belief in diet can also have a positive effect on health, as the people of Japan believe in a traditional Japanese diet that places a strong emphasis on the consumption of fish, vegetables, and soy products [38]. Studies have shown that consuming Japan diet will reduce the risk of death from all causes and cardiovascular in various locations throughout Japan [39].

4.3 Culture Pressure

Kadazandusun is distinct from others due to its belief and distinctive culture. A family's long-established rules are exceedingly difficult to break. They may inadvertently cause conflict or be considered insulting to community customs if they are not followed, as claimed by a participant in the focus group. According to [40], social and environmental influences at multiple levels, including cultural practices, can exacerbate food choices. Societal influences with peer pressure are one of the contributors to transitioning to a healthy diet. The study by [41], [42] discovered that co-workers prevented plans for a healthy diet on a regular or occasional basis in 75% of participants in his research. This situation illustrates that social pressures affect the choice of nutritious foods, as well as the fact that members of the Kadazandusun community would experience sentiments of being left aside if they did not stick to the diet that their neighbors and friends followed.

Food is not just a sign of social background but serves as a symbol or culture of a particular ethnic or religious group [43]. Lihing and a tajau containing rice tapai fermented into alcohol must be brought to a wedding in the Kadazandusun community. It is one of four fundamental marriage transmissions for the Kadazan people. This reinforces the opinion expressed in the focus group discussion that alcohol is an old tradition that must be included in their functions.

Study limitations: Participants may be biased in answering the question because it depends on their exposure since childhood. The lack of generalizability due small sample size limits the study output.

V. CONCLUSION

This study provides Kadazandusun barriers to adopting a healthier lifestyle for nasopharyngeal carcinoma. Our finding shows the need for community-based approaches to improving community understanding of this malignancy. Cultural beliefs must effectively address to gain public awareness and establishment of cancer preventive strategies.

RECOMMENDATION

A regular awareness campaign among the target or high-risk group with community-based approaches related to a nasopharyngeal carcinoma risk factor is needed to reduce the incidence.

ACKNOWLEDGMENT

We wish to sincerely thank the Ministry of Health and the Sabah State Health Department for their assistance and cooperation. This research received no external funding.

REFERENCES

[1] A. Ahmad *et al.*, “The incidence of nasopharyngeal carcinoma in Pahang state of Malaysia from 2012 to 2017,” *Malaysian J. Med. Sci.*, vol. 28, no. 1, pp. 66–74, 2021.

[2] National Cancer Registry Department, “Malaysia national cancer registry report (MNCRR) 2012-2016,” 2019 [Online], June 2019. Available:https://www.moh.gov.my/moh/resources/Penerbitan/Laporan/Umum/2012-2016%20(MNCRR)/MNCR_2012-2016_FINAL_(PUBLISHED_2019).pdf

[3] Non-Communicable Diseases Unit, Public Health Division, “Sabah cancer registry report 2012-2016,” 2019. [Online], June 2019.Available: http://www.jknsabah.gov.my/v8/muatturun/borangdokumen/kesihatanawam/Sabah%20Cancer%20Registry%20Report%202012-2016.pdf

[4] E. Hung, C. Wong, Y. Tan, and M. Dompok, “The first report on incidence of nasopharyngeal carcinoma in Sabah , Borneo,” *S.Karger Ag, Basel*, pp. 258–262, 2021.

[5] Malaysia, “National strategic plan for cancer control,” [Online],2021.Available: https://www.moh.gov.my/moh/resources/Penerbitan/Rujukan/NCD/Kanser/National_Strategic_Plan_for_Cancer_Control_Programme_2021-2025.pdf

[6] S. I. Okekpa *et al.*, “Nasopharyngeal carcinoma (NPC) risk factors: A systematic review and meta-analysis of the association with lifestyle, diets, socioeconomic and sociodemographic in asian region,” *Asian Pacific J. Cancer Prev.*, vol. 20, no. 11, pp. 3505–3514, 2019.

[7] Z. M. Mai *et al.*, “Dietary fiber intake from fresh and preserved food and risk of nasopharyngeal carcinoma: observational evidence from a Chinese population,” *Nutr. J.*, vol. 20, no. 1, pp. 1–10, 2021.

[8] W. Ekburanawat *et al.*, “Evaluation of non-viral risk factors for nasopharyngeal carcinoma in Thailand: Results from a case-control

study," *Asian Pacific J. Cancer Prev.*, vol. 11, no. 4, pp. 929–932, 2010.
[9] S. K. Yong, T. C. Ha, M. C. R. Yeo, V. Gaborieau, J. D. McKay, and J. Wee, "Associations of lifestyle and diet with the risk of nasopharyngeal carcinoma in Singapore: A case–control study," *Chin. J. Cancer*, vol. 36, no. 1, pp. 3–10, 2017.
[10] M. Long, Z. Fu, P. Li, and Z. Nie, "Cigarette smoking and the risk of nasopharyngeal carcinoma: A meta-analysis of epidemiological studies," *BMJ Open*, vol. 7, no. 10, pp. 14–17, 2017.
[11] Department Statistic of Malaysia (DOSM), "Key finding population and housing census of Malaysia 2020: Administrative District," 2022. [Online], July 2022, Available: https://www.mycensus.gov.my
[12] K. Akuoko, "Traditional values, socio-cultural factors and human resource management practices in public sector organisations in Ghana," *J. Sci. Technol.*, vol. 28, no. 3, pp. 58–69, 2009.
[13] J. Pugh-Kitingan, "Cultural and religious diversity in sabah and relationships with surrounding areas," *Islam Cult. Divers. Southeast Asia*, pp. 269–294, 2015.
[14] S. T. Teoh, B. Bent, T. Fong, and M. C. C. Lee, "A Nutrition study of the interior, west coast and kudat divisions Sabah," 1981. Kuala Lumpur: Faculty Of Medicine, University Of Malaya, 1981.pp 83-98
[15] F. J. He, Y. Ma, and G. A. MacGregor, "Salt reduction to prevent hypertension and cardiovascular disease: JACC State-of-the-Art Review," *J. Am. Coll. Cardiol.*, vol. 75, no. 6, pp. 632–647, 2020.
[16] D. K. A. Sapawi, Y. B. H. Ooi, S. Ibrahim, and Y. C. Lai, "Food safety concerns influence neophobic response towards kadazandusun traditional food in domestic tourists," *J. Tour. Hosp. Environ. Manag.*, vol. 4, no. 13, pp. 34–58, 2019.
[17] B. Yan, L. Zhang, and Z. Shao, "Consumption of processed and pickled food and esophageal cancer risk: A systematic review and meta-analysis," *Bull. Cancer*, vol. 105, no. 11, pp. 992–1002, 2018.
[18] D. P. Huang, J. H. C. Ho, K. S. Webb, B. J. Wood, and T. A. Gough, "Volatile nitrosamines in salt-preserved fish before and after cooking," *Food Cosmet. Toxicol.*, vol. 19, no. C, pp. 167–171, 1981.
[19] J. E. Al khaid Hakimi, Talal Thubaity, Al and N. al solami. Al, "Smoked cooked meat as a risk factor for Nasopharyngeal Carcinoma : A case control study among Saudi populations," *Saudi J. Oto-Rhino-Laryngology Head Neck Surg.*, vol. 20, no. 1, pp. 13–19, 2018.
[20] H. Parada *et al.*, "Grilled , barbecued , and smoked meat intake and survival following breast cancer," *JNCI J Natl Cancer Inst, 2017*, vol. 109, pp. 1–8, 2017.
[21] C. B. Seok, "The perception of characteristics, behaviors, cultures and traditions toward own and other ethnic groups," *Eur. Cent. Res. Train. Dev. UK*, vol. 1, no. 1, pp. 1–10, 2013.
[22] H. Hussin, "Ritual, identity and changes in the west coast of sabah: the experience of the kadazan penampang community," *J. Southeast Asian Stud.*, vol. 12, pp. 189–210, 2007.
[23] E. De Stcfani, L. Fierrob, M. T. Larrinagab, J. C. Balbib, A. Roncoa, and M. Mendilaharsu, "Smoking of hand-rolled cigarettes as a risk factor for small cell lung cancer in men : a case-control study from Uruguay," *J. lung cancer , elsevier*, vol. 11, pp. 191–199, 1994.
[24] W. L. Hsu *et al.*, "Cigarette smoking increases the risk of nasopharyngeal carcinoma through the elevated level of IgA antibody against Epstein-Barr virus capsid antigen: A mediation analysis," *Cancer Med.*, vol. 9, no. 5, pp. 1867–1876, 2020.
[25] A. Kocyigit, S. Selek, H. Celik, and M. Dikilitas, "Mutation research / genetic toxicology and environmental mutagenesis mononuclear leukocyte dna damage and oxidative stress : the association with smoking of hand-rolled and filter-cigarettes," *Mutat. Res. - Genet. Toxicol. Environ. Mutagen.*, vol. 721, no. 2, pp. 136–141, 2011.
[26] B. and Clark, "Appendix 9 : A 15-point checklist of criteria for good thematic analysis process (Braun and Clarke , 2006)," p. 37, 2006.
[27] R. Fles *et al.*, "Effectiveness of a multicentre nasopharyngeal carcinoma awareness programme in Indonesia," *BMJ Open*, vol. 6, no. 1, 2016.
[28] W. Hsu *et al.*, "Lowered risk of nasopharyngeal carcinoma and intake of plant vitamin , fresh fish , green tea and coffee : a case-control study in Taiwan," *PLoS One*, vol. 7, no. 7, 2012.
[29] C. Tan, G. B. Goh, J. Youn, J. C. Yu, and S. Singh, "Public awareness and knowledge of liver health and diseases in Singapore," *Gastroenterol. Hepatol.*, pp. 1–11, 2021.
[30] C. A. Chao, L. Huang, K. Visvanathan, K. Mwakatobe, N. Masalu, and A. F. Rositch, "Understanding women ' s perspectives on breast cancer is essential for cancer control : knowledge , risk awareness , and care- seeking in Mwanza , Tanzania," *BMC Public Health*, vol. 20, no. 930, pp. 1–11, 2020.
[31] M. Jeruszka-bielak *et al.*, "Are nutrition-related knowledge and attitudes reflected in lifestyle and health among elderly people ? a study across five european countries," *Front. Physiol.*, vol. 9, no. July, pp. 1–13, 2018.
[32] D. X. Pham, T. T. T Pham, T. N. Pham, and T. D. Bui, "A Cross—sectional study about knowledge, awareness and perception of risk factors for cancer among cancer-patients relatives and healthy adults in Ho Chi Minh City, Vietnam," *Asian Pacific J. Cancer Prev.*, vol. 22, no. 1, pp. 277–285, 2021.
[33] X. Chen *et al.*, "Differences in rural and urban health information access and use," *J. Rural Heal.*, vol. 0, pp. 1–13, 2018.
[34] M. L. Scalvedi, L. Gennaro, A. Saba, and L. Rossi, "Relationship between nutrition knowledge and dietary intake : an assessment among a sample of Italian Adults," *Front. Nutr.*, vol. 8, no. September, pp. 1–13, 2021.
[35] L. McMorrow, A. Ludbrook, J. I. Macdiarmid, and D. Olajide, "Perceived barriers towards healthy eating and their association with fruit and vegetable consumption," *J. Public Heal. (United Kingdom)*, vol. 39, no. 2, pp. 330–338, 2017.
[36] R. Seguin, L. Connor, M. Nelson, A. Lacroix, and G. Eldridge, "Understanding barriers and facilitators to healthy eating and active

living in rural communities," *J. Nutr. Metab.*, vol. 2014, pp. 23–25, 2014.
[37] S. Boatemaa, D. M. Badasu, and A. Aikins, "Food beliefs and practices in urban poor communities in Accra : implications for health interventions," *BMC Public Health*, vol. 18, no. 434, pp. 1–12, 2018.
[38] Tamio Teramoto, "' Japan diet ' and health — the present and future," *J. Nutr. Sci. Vitaminol. Vitaminol.*, vol. 65, pp. 29–33, 2019.
[39] S. Matsuyama, N. Sawada, Y. Tomata, S. Zhang, A. Goto, and T. Yamaji, "Association between adherence to the Japanese diet and all - cause and cause - specific mortality : the Japan Public health center - based prospective study," *Eur. J. Nutr.*, vol. 60, no. 3, pp. 1327–1336, 2021.
[40] E. C. Monterrosa, E. A. Frongillo, A. Drewnowski, S. De Pee, and S. Vandevijvere, "Sociocultural influences on food choices and implications for sustainable healthy diets," *Food Nutr. Bull.*, vol. 41, pp. 559–573, 2020.
[41] Y. E. Miassi, F. K. Dossa, O. Zannou, Ş. Akdemir, and I. Koca, "Socio - cultural and economic factors affecting the choice of food diet in West Africa : a two - stage Heckman approach," *Discov. Food*, vol. 2, no. 16, pp. 2–10, 2022.
[42] N. Alqahtani, "The effects of peer pressure on nutrition attitudes and food selection," *Int. J. Med. Res. Heal. Sci.*, vol. 9, no. 11, pp. 23–30, 2020.
[43] G. Ma, "Food , eating behavior , and culture in Chinese society," *J. Ethn. food*, vol. 2, pp. 195–199, 2015.

AUTHORS

First Author – Dr. Raja Muhammaad Raja Omar (MPH), Otorhinolaryngology Department of Hospital Queen Elizabeth Kota Kinabalu Sabah. Malaysia. royalmds@hotmail.com
Second Author – Dr. Che Wan Ilmiyah (MPH) Community & Family Medicine Department, Faculty of Medicine and Health Sciences, UMS. ilmiyah84@gmail.com
Third Author – Dr. Haryati Abdul Karim (Ph.D.) Faculty of Social Science and Humanities University Malaysia Sabah UMS. haryati@ums.edu.my
Fourth Author – Prof. Fredie Robinson (Ph.D.) Community & Family Medicine Department, Faculty of Medicine and Health Sciences, UMS. freddie@ums.edu.my

Correspondence Author – Prof. Fredie Robinson (Ph.D.) Community & Family Medicine Department, Faculty of Medicine and Health Sciences, UMS. freddie@ums.edu.my. +6088-320 000.