

Applying Health and Food Literacy Models to College Students' Nutrition Knowledge and Salt Consumption

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Abstract This descriptive quantitative study examined the college students' nutrition knowledge and salt consumption by applying Nutbeam's Health Literacy (NHL) and Grier's Food Literacy (GFL) models. These models identified the underlying factors behind nutritional knowledge on salt and salt consumption. The study surveyed 664 students from 13 colleges of different courses from first year to fifth year in a state university in Diliman, Quezon City, through stratified random sampling. Data were analyzed using frequency and percentages. The survey revealed that 96% of the respondents were unaware of the recommended salt intake per day while 72% preferred salted food because of its affordability, accessibility, and taste than unsalted food. More than half of the respondents add salt for flavor during cooking, and add salt to their food while eating and 67% do not control their salt intake. Based on these results, it may be confirmed that health and food literacy are related to college students' unhealthy dietary habits. Thus, the empirical evidence may infer how health professionals may develop health literacy materials that will enhance students' knowledge on healthy dietary practices, in particular salt consumption.

Keywords: health literacy, food literacy, college students, nutrition knowledge and habits, salt consumption

Introduction

“College students find it difficult to follow healthy dietary habits” (Lupi et al., 2015, p.2). Taste preference, lack of self-discipline, moral conviction, stress, body image and self-concept, time and convenience, eating habits, and knowledge contribute to their unhealthy dietary habits. Although they perceive that knowledge can change eating patterns, this does not automatically lead to healthier food choices (Delien et al., 2014; Loomes & Croft, 2013; Lupi et al., 2015; Majors, 2015; Pangan et al., 2012; Rufino, 2015).

Further studies (Ansari et al., 2015; Chung, 2017; Daly et al., 2016; Krause et al., 2018; Luta et al., 2018; Majors, 2015; Platania et al., 2016) attested that unhealthy dietary habits of college students, and chronic illnesses of adolescents are associated with health and food literacy.

Health Literacy

Health literacy is a determinant of health status (Kuczmarski et al., 2016). The World Health Organization’s (WHO) European Health Literacy Survey (2013, p.1) reported “a growing number of people who have chronic conditions as they get older can be attributed to weak health literacy competencies.” According to Sorensen and colleagues (2015) and WHO (2013), this resulted in less healthy choices and more hospitalization.

Studies reveal that a high literacy rate does not automatically translate to a high health literacy rate. For example, Filipinos have a 96.29% literacy rate but have a low health literacy rate because of the curative attitude they have in managing their health (Leachon, 2014; Mateo 2014).

Sun Life Financial Asia, an international financial services organization, which conducts a periodic study of health

trends to provide health indices of countries like Hong Kong, Philippines, Japan, Indonesia, India, China, Singapore, Vietnam, Malaysia, Canada, the United States, the United Kingdom, Ireland, Australia, and Bermuda, revealed that 45% of Filipinos admitted to unhealthy eating habits (Dumlao, 2014).

Health Literacy and Nutrition

Studies show health literacy-related problems linked to nutrition. Kuczmarski, and colleagues (2016) stated that “limited health literacy was associated with less dietary variety in older Japanese adults (p.2).” Similarly, Chung (2017, p.2) indicated that the world is at risk of “obesity epidemic” while Colatruglio and Slater (2014, p.3) noted that in Canada, “67% men and 54% women are overweight or obese; 19.8% of 5 to 17 year old are classified as overweight and 11.7% are obese.” These studies link obesity to poor food and nutrition literacy.

Furthermore, (Friis et al., 2016; Golluche et al., 2017; Wikkeling- Scott & Rikard, 2017) relate health literacy with nutrition-related disease, health behavior, and diet. Likewise, Kuczmarski and colleagues (2016, p.2) concluded that “health literacy is correlated with nutrition skills such as estimation of portion size, understanding food labels, and seeking nutrition sources that affect dietary quality.”

Also, Hassan and colleagues (2018) assessed the association between nutrition literacy and diet quality of 388 adolescents aged 13 to 15. They found that “diet quality scores were higher in boys. Sources that were mostly used to collect nutritional information such as the Internet (18.6%), families (15.2%) and books (13.1%) could enhance diet quality. Likewise, an increase in functional nutrition literacy was associated with lower sugar intake and better energy balance in boys and higher dairy intake in girls. Since there was an association between health literacy and diet quality amongst adolescents, health policy-makers should develop new

strategies that focus on increasing understanding of nutrition literacy during adolescence” (Hassan et al., 2018, p.1).

Health Literacy Resources and Interventions on Nutrition

The Assets Coming Together (ACT), a youth center of excellence on research facts and findings in positive youth development reported that low health literacy can be addressed by “having good health literacy skills that help adolescents get the information and services they need” (Manganello & Shone, 2013, p. 1). Similarly, Dr. Anthony Leachon, Philippine College of Physicians President, proposed inclusion of health literacy in basic education to help students learn how nutrition affects their well-being. Presently, while there are available resources on the consequences of excessive salt intake and salt reduction strategies, only a few focus on the Philippine context.

Literacy Models

Figure 1 shows how Nutbeam’s health literacy and Grier’s food literacy models explain the factors that influence students’ nutritional knowledge and salt consumption habits.

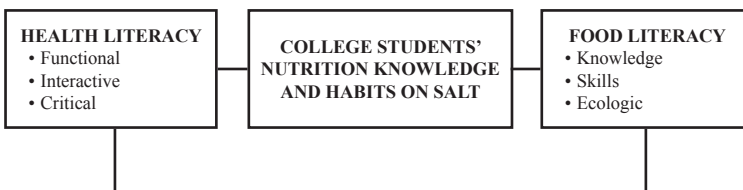


Figure 1. Framework of the Study.

Health literacy is a range of interconnected abilities categorized into functional, interpersonal, and critical skills that allow people to access and understand health conditions, make safer health choices, and use health care (Johnson, 2014; Manganello & Shone, 2013; Nutbeam, 2006). These are needed by the students to be more critical of the food

salt content, and be more mindful of their salt consumption habits. Meanwhile, food literacy encompasses knowledge, skills, and ecologic influences that affect one's dietary behavior. The framework also shows the relationship of health and food literacy with student's knowledge on salt and salt consumption habits.

The researcher conducted the study because it has been discovered that literature remains limited on health literacy particularly on Filipino's salt intake; the number of "Filipinos with hypertension is increasing, especially among the youth" (Jaymalin, 2013, p.1); and there is a dearth of materials on the topic that would intensify salt awareness among young people (Carandang-Castillo et al., 2014).

Purposes of the Research

This paper examines college students' nutritional knowledge, perceptions, awareness of sodium's benefits and effects, recommended amount, frequency and reason for salt intake, and salt regulation practices by applying Nutbeam's health literacy (**NHL**) and Grier's food literacy (**GFL**) models. Specifically, the study sought answers to the following questions:

1. What is the health and nutrition literacy of college students?
2. What are the factors that influence their knowledge of salt and salt consumption habits?
3. What are the knowledge on salt and salt consumption habits of college students?

Methodology

Research Design

The study used descriptive survey that explored college students' nutrition knowledge and salt consumption.

Participants

Using stratified sampling, the researcher included 664 students (334 males and 330 females), ages 16-24 years old from first to fifth year, attending 13 colleges in a state university in Diliman, Quezon City. The sample size was distributed proportionally based on each college's population size with respect to the population of the university as a whole.

Instrument

The researcher reviewed health and food literacy questionnaires, such as the Protocol for Population Level Sodium Determination in a 24-hour Urine samples (WHO & PAHO, 2010); Contemporary Nutrition: A Functional Approach (Wardlaw & Smith, 2009), Salt Consumer Survey (Wylie et al., 2011), and Knowledge, Attitudes and Behavior toward Dietary Salt (USDA Home and Garden Bulletin I No.232, April 1986). The researcher adapted these questionnaires in developing a culture-sensitive questionnaire for the study. Then, the researcher added items that focused on Filipino dishes and condiments related to salt consumption. Questions on perceptions, reasons for consuming salty foods, awareness and knowledge of the recommended daily sodium intake, sodium's benefits and effects on health, and habits (frequency of salt intake, salt regulation, and reduction) were also included. The researcher finalized the questionnaire in three sections with a total of 24 questions on knowledge and salt consumption. Experts in Health Education, Language Education, and Nephrology validated the questionnaire.

Moreover, the researcher applied the Confirmatory

factor analysis through principal components analysis, Varimax rotation method and Kaiser-Meyer Olkin (KMO) to ascertain construct validity of .846 which indicates suitability for factor analysis while Chronbach Alpha was used through statistical computations via SPSS version 20 which yielded a Chronbach Alpha of .771 indicative of high reliability.

Data Collection and Data Analysis

Pre-testing

The researcher used simple random sampling, and pre-tested the questionnaire to 25 female and 25 male students enrolled in the National Service Training Program and health education classes during the second semester of Academic Year 2016-2017. The researcher incorporated the respondents' comments and experts' validation in the final questionnaire.

Survey

The researcher sought permission from the college secretaries and dormitory managers to conduct the survey. During the meeting with the 542 respondents in the field, the researcher requested for their consent and assured confidentiality as well. Meanwhile, the researcher oriented and sought consent from the 122 respondents online. Then, frequency and percentages were computed from the data.

Results and Discussion

Health and Nutrition Literacy describe the knowledge and salt consumption of students as well as the underlying influential factors.

Table 1 shows that 38.3% of college students prefer and consume junk food, consisting of processed foods, most of which come from fast foods, canned goods, condiments, and

foods sold in canteens.

Table 1. Summary of Food Consumed by College Students

Foods consumed by the students	Number of Students Who Consumed per College																	Total %		
	CHE	CHK	CMC	CMu	CS	CSSP	EDUK	ENGG	NCPAG	SE	SLIS	STAT	USB	AIT	ARCHI	CAL	CFA		TOTAL	RANK
A. Fastfood	17	6	2	1	0	16	8	17	5	15	4	7	15	5	5	20	9	152	5	7.08
B. Viands	16	12	17	22	4	37	17	66	9	32	11	17	22	19	18	38	9	366	2	17.00
C. Noodles	15	17	11	9	2	44	11	62	6	22	7	6	20	17	15	24	23	311	3	14.50
D. Street Food	2	2	4	8	1	2	3	16	4	0	0	1	2	1	5	3	7	61	8	2.84
E. Junk Food	36	58	22	20	4	85	36	179	26	46	19	38	66	42	29	78	38	822	1	38.3
F. Processed food	18	32	15	12	0	25	6	59	7	12	8	10	13	5	10	34	4	270	4	12.6
G. Fish	4	2	2	0	2	14	2	16	5	6	0	2	1	3	2	5	3	68	6	3.17
H. Condiments	2	3	0	1	1	5	4	21	0	5	9	0	5	0	2	6	2	66	7	3.07

I. Bread	0	3	0	0	0	4	1	4	0	0	0	0	0	1	0	1	2	16	9	0.74
J. Fried Rice	0	3	0	0	0	0	0	3	0	0	0	0	0	1	1	3	0	11	10	0.51
K. Canteen food	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	11	0.23
	2148																		100	

Legend:

- CHE – College of Home Economics
- CHK – College of Human Kinetics
- CMC – College of Mass Communication
- CMu – College of Music
- CS – College of Science
- CSSP – College of Social Science and Philosophy
- EDUK – College of Education
- ENGG – College of Engineering
- NCPAG – National College of Public Administration and Governance
- SE – School of Economics
- SLIS – School of Library and Information Science
- STAT – School of Statistics
- VSB – Virata School of Business
- AIT – Asian Institute of Tourism
- ARCH –College of Architecture
- CAL – College of Arts and Letters
- CFA – College of Fine Arts

Furthermore, Tables 1 and 2 reveal that all these foods are correctly perceived to contain salt because most have more than 400 mg of salt per serving (Kam, 2006; Farrand et al., 2017; Fitday, 2019; Mhurchu et al., 2011; Schiff, 2009; TopTen.ph., 2016; Unilever, 2016; WebMD, 2013). These include instant noodles, which may contain up to 2,000 mg or more of sodium per pack which is around 80% more than the recommended daily intake.

Table 2. Sodium content of Food in Milligrams (mg)

Food	Serving Size	Equivalent sodium content in mg per serving size
Fast food		
Fast Food 1	1 any burger	0
	1 pc fried chicken	400
	1 plate of pancit palabok	536
	1 order of large fries	700
	1 plate of 2 pcs burger steak	790
Fast Food 2	1 individual size coleslaw (113.5g)	180
	41g grilled chicken	
	1 twister sandwich (234.6g)	220
	Hot wings (51.5g)	320
	1 individual serving mashed potato with gravy (145.4g)	320
	1 Twister sandwich=234.6g	500
	170.2g Popcorn nuggets	1260
	1820	
Burger	1 (hamburger)	534
	1 (cheeseburger)	1051
Silogs	Fast Food 1 serving tapsilog	0
	Tapsilog 1 = 1 meal	91
	Longganisalog 1=2 pcs=63g	320
Pizza	1 slice	760
Viands		
Adobo	Chicken adobo (1 serving=152g)	784
	Pork adobo (1 serving=8oz)	793
Fried chicken	100g	77
	1 medium size no skin	210
	100g meatless, breaded, fried	400
Pork sisig	1 serving=50g	978
Steak	100g	45-55
	3oz any type (sirloin, tenderloin, flank or roast cut)	58
Eggs	1 boiled (100g)	124
	1 scrambled (100)	145
	1 fried=100g	207
	1 poached=100g	297
	*1 salted egg	350
*Sinigang	*1 pork sinigang (320g)	23
*Nilaga	1 pork	166.1

*Lumpiang	*3	490
Shanghai		
*Barbeque	5oz pork (140g)	650
*Caldereta	1 serving=565g	679
*Nilaga	*beef (1 serving=538.1)	874
*Tinola	*1 bowl	918
Menudo	1 cup (245g)	1139.3
Street foods		
Fishball	1=5pcs	10
Siomai	1 pc beef siomai	50
	1 pc pork siomai	51
Kikiam	1=88.7g	90
*Kwek-kwek	*1=5 eggs	165
Junk foods		
*Fish crackers	1 pack (30g)	85
(1=30g)		
Watermelon	1 oz (28.35)	28.1
seeds	*Buttered 1 cup	109
*Popcorn	1 oz plain	149
Chips	1 oz cashews with salt	181
Peanuts	1 oz peanuts with salt	190
	100g	210
Fries	1=0.5cup	230
Cornicks	50mg	233-499
Tortilla, vegetable, potato, soy) all varieties	1 pack	2,000
Instant noodles		
Processed foods		
Canned goods	75g (2 ½ oz) Fish (Sardines, salmon, tuna, mackerel)	185-312
	*corned beef ¼ cup = (2 oz)	490
	*spam 2 oz (56g)	790
	Ham or chicken 75g (2 ½ oz)	774-1064
Tocino	1=112g	720
Hotdog	100g	1,090
Bacon cooked	75g (2 ½ oz)	920-1247
Bacon	Baked 100g	2,193

Fish		
*Daing na	*1	35.2
bangus	100g	200
Dried fish	3oz	484
Fried fish	*100	784
*Tinapa (smoked fish)		
<hr/>		
Condiments	1 tbsp (14g)	460
Liquid	15ml (1 tbsp)	899-1244
seasoning	1 tbsp (15g)	1190
Toyo (Soy sauce)	*1 tbsp	1390
Fish sauce		
(patis)	1 tbsp tomato sauce	2
*Bagoong	1 tbsp low sodium	3
Foods with	1 packet tomato chili sauce	80
hidden	1 tbsp regular	167
Salt	1 tbsp reduced sugar	190
*Ketchup/ catsup		
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Crackers	30g all varieties with salt	30
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Bread	1 slice=35g (all types)	182-211
	2 slices (wheat or white)	340
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Fried rice	100g	396
	*Chao fan 1 cup	740
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Canteen foods		
Pasta	100g	6
Fried food	1oz	110
Food rich in	Per slice (8g)	175
sauce/saucy	½ cup using low sodium stock	250
food	½ cup stir-fry using bouillon cube	600-800
vegetables		

As gleaned from the study, 96% of college students are unaware of the WHO's recommended salt intake, 51% do not know the benefits of salt, 50% are aware of the danger of food with excessive salt still they eat them; and 33% are unaware of the negative health consequence of excessive sodium. These results show that students' knowledge on salt

is inadequate. Grier's Food literacy (GLF) model corroborates this finding using three factors. First is the intrinsic factors that include the individual's knowledge, awareness and perceptions on salt.

Studies in Canada and Spain reveal that people have no idea of the recommended sodium intake per day (Campbell, 2014; Coyne, 2018). Similarly, Aktas and Ozdogan (2016) revealed the limited knowledge about nutritional literacy of 835 undergraduate students. The second pertains to extrinsic factors (social determinants of health). Results revealed that most college students preferred salty foods because of their availability, affordability, accessibility, and comfort. Manganello and Shone (2013) support this in their statement, "Adolescents make independent health decisions and manage their own health (p.1)." Moreover, Abdull Hakim and colleagues (2012) explained that college students tend to have poor eating practices as noted in their study of 200 students in Selangor, Malaysia with 33% of male and 29.1% of female consuming fast food once to four times a week. Thus, the nourishment needed for sustaining a healthy body is often times neglected.

Interestingly, factors like financial limitation, craving, food promotions, self-discipline, lack of parental control, stress, and lack of time to eat or cook explain in part why some students are healthier than others and why some are not as healthy as they could be (Abd El-Mouty, 2016; Deliens et al., 2014; Eating Habits of College Students, 2011; Healthy People 2020, 2014; Montecalbo & Cardenas, 2015, & Nestle et al., 1998).

Salt consumption

Consumption frequency

College students' eating habits lean toward the salty side. Majority (68%) eat salty food at least once in five days, 55% add

salt in some meals; 43% add salt in cooking; and 72% preferred salted food. Moreover, 56% choose canned or frozen food once or twice a month, 40% use commercially-prepared meals or dehydrated soups once or twice a month, 34% occasionally eat cheese, salted nuts, popcorn, pretzels, corn or potato chips, and add seasoning mixes, salad dressings, and condiments. Furthermore, 33% choose salty sauces or foods when dining out twice every two weeks.

Reasons for Consumption

Table 3 shows that preference, affordability, accessibility, quality and comfort affect college students' high salt intake.

Table 3. Reasons for Eating Salty Foods

Reasons for eating these food	Frequency		
	Once a day	Once a week	Thrice a month
Preference, quality, accessibility, availability	0.000000	66.66667	33.33333
Affordability, comfort, availability	6.410256	64.10256	21.79487
Affordability, accessibility	3.571429	67.85714	37.50000
Comfort, accessibility, affordability	0.000000	100.0000	0.000000
Comfort, accessibility, affordability	4.316546	63.30935	33.09352
Affordability, accessibility	7.142857	57.14286	29.28571
Affordability	0.000000	55.55333	44.44444
Quality, preference	0.000000	50.00000	50.00000
Affordability, accessibility	0.000000	100.0000	0.000000
Affordability, accessibility	50.00000	25.00000	25.00000
Affordability, accessibility	0.000000	50.00000	50.00000

Results show that 61% of students considered lowering salt in their diets as somewhat important while 67% do not control at all. About 53% add little salt in their food; 26% drink lots of water after eating salty food; 11% changed into a healthier diet; and 5% avoid oily food. It can be deduced that students are unmindful of the food's salt content and are less interested in

regulating their salt intake. Grier's food literacy model affirms this through the third factor that influence nutrition habits: predictors (social-cultural influences and eating practices). For example, Filipinos are "fond of dipping on or pairing anything with their dishes. Some use lots of gravy and pour soup on rice" (Philnews, 2013, p.1). Similar habit is predominant among Chinese and Japanese (Brown et al., 2009). In some Asian countries, sodium come from those added in cooking (75%) and 8% from soy sauce. Sodium intake from salted snacks of male college students reached 3,904 mg while female consumed 2,628 mg (Brown et al., 2009; Campbell et al., 2014; Khan, 1983; Lupi et al., 2015). "Filipinos ingest three times the recommended amount of salt due to preference" ("The Salty Filipino Diet and the Hypertensive Cook", 2013, p.3). "Most Americans more than double the 1,500 mg of salt a day" (Ozersky, 2010, p. 443). Canadians consume "3,100 mg of sodium daily" (Campbell et al., 2014, p.469). "Median sodium intake of Dutch adults was estimated to be 3400 mg/day" (Hendriksen et al., 2015, p.1). The mean salt intake of young adults in Malaysia was an alarming 10,800 mg/day" (Jiet & Soma, 2017, pp. 1). Studies on youth's consumption patterns have established the relationship between socioeconomic conditions, lack of knowledge, and risk-taking tendencies on their food consumption and health habits (Azanza, 2001; Platania et al., 2016).

A study in New Zealand showed that "People were less concerned with salt (37%) than with saturated fat (66%), sugar (51%), artificial colors (47%) or artificial flavors (46%)" (Wylie et al., 2011, p. 23) . Only 10% household meal planners read nutrition facts. Youth aged 18-29 had low health literacy because they don't read food labels which lead to low dietary quality and vulnerability to obesity and diabetes (Cha et al., 2014). According to Tanton and colleagues (2015, p.1), "Lifestyle diseases develop through our unconscious habits of consuming salt in our daily diet. This contributes to hypertension which can lead to chronic diseases that could have been prevented by taking no more than five grams of salt daily." Also, Brown and

colleagues (2009), and Medlineplus studies prove that excessive salt can harm our body and trigger diseases such as renal failure, and stroke. Likewise, Tacio (2017) explained that “Data show that people who eat salty food excessively have a shorter life span than those who don’t (p.1).”

Furthermore, Trieu and colleagues (2015) reported that “Sodium consumption of more than 2000 mg/d is estimated to cause 1.65 million cardiovascular related deaths each year (p.2).” Thus, WHO recommended salt reduction of 2000 mg daily to prevent non-communicable diseases. Salt reduction strategies include food reformulation to lower sodium content and consumer awareness or behavior change programs through media campaign (Hendriksen et al., 2015; Trieu et al., 2015).

The researcher found that the interrelationship between knowledge and salt consumption habits are associated with increased risk of cardiovascular diseases, as shown in Figure 2.

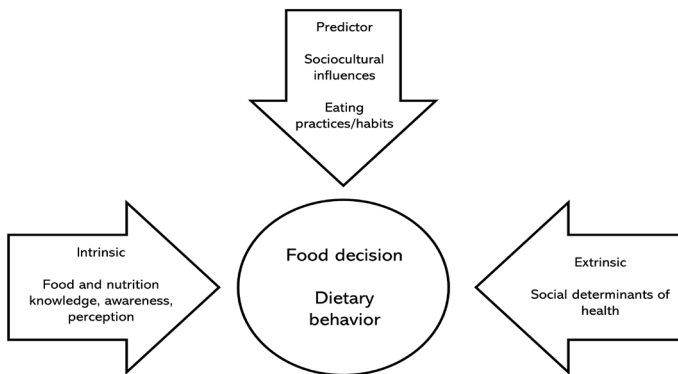


Figure 2. Adapted and Modified Version of *Grier's Food Literacy Model(GFL)*.

Furthermore, the survey revealed that 96% of the students were unaware of the recommended daily salt intake while 72% preferred salted food because of its affordability, accessibility, and taste. More than half add salt for flavor during cooking, and add salt to their food while eating and 67% does not control salt intake. These results confirmed

that health and food literacy are related to college students' unhealthy dietary habits.

Conclusions

The study aimed to describe and identify the underlying factors that affect the students' knowledge on salt and consumption of salt by applying Nutbeam's Health literacy and Grier's Food literacy models. The findings of the study addressed the lack of baseline data on knowledge on salt and consumption of salt, and dearth of health literacy materials on salt in the Philippine setting.

In summary, the study showed that students consume foods like instant noodles with 2,000 mg or more of sodium per pack, which is about 80% more than the recommended daily sodium intake. Likewise, students' knowledge on salt is inadequate and students' eating habits lean toward the salty side. Majority of their high salt food consumption is influenced by preference, affordability, accessibility, quality and comfort and 68% eat salty food at least once in five days. Moreover, students are unmindful of the foods' salt content and are less interested in regulating their salt intake.

Thus, the study concluded that health and food literacy play a role in college students' dietary habits (Abd El-Mouty, 2016; Abdull Hakim, et.al., 2012; Campagnoli et al., 2012; Hesamedin et al., 2016; Jiet & Soma, 2017; Nastakin et al., 2015; Tanton et al., 2015; Vaitkeviciute et al., 2014) as a result of several factors like intrinsic, extrinsic, and predictors, based on Grier's Food Literacy Model (GFL). In effect, the interaction of these factors leads to cardiovascular diseases, kidney problems, edema, cancer, stroke, and osteoporosis (Dickinson et al., 2012; Farquhar et al., 2015; Kuwahara, 2010; Ting et al., 2015).

Recommendations

Based on the findings, some recommendations are made. Firstly, future research should include beverages and other foods with hidden salt and an actual quantification of salt intake and correlate it with the respondent's health condition.



Figure 3. Health literacy materials on nutritional knowledge and salt consumption.

Secondly, it is advisable that curricular content on and delivery of critical health literacy should be strengthened through the development of health literacy materials (Worldbank, 1999) on salt following the framework shown in Figure 3. It is also recommended that future studies assess the impact of these materials. Then, healthy eating among students should be encouraged by creating a supportive environment, implementing policies such as ban in selling salty snacks and beverages, providing affordable alternatives, and reducing sodium in foods served in institutional settings (Beckerman et al., 2017; Centers for Disease Control and Prevention [CDC], 2012; He et al., 2010).

Last but not the least, the researcher urges the government to review salt intake reduction initiatives and encourage the public to “go fresh and natural; avoid condiments; use salt in moderation; plan low-sodium meals; cut-down on instant noodles; rinse-off canned/frozen foods before eating; and read labels” (Batacagan-Abueg et al., 2013, p. 683).

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