

Use and Understanding of Nutrition Labeling among Elderly Men and Women in Malaysia

Cheong SM^{1*}, Jasvinder Kaur¹, Lim KH¹, Ho BK² & Mohmad S³

¹ *Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia, Jalan Bangsar, 50590 Kuala Lumpur, Malaysia.*

² *Klang Health Department, Bandar Botanik, Jalan Langat Kelang, 42100 Klang, Selangor, Malaysia*

³ *Family Health Development, Ministry of Health Malaysia, Block E10, Complex E, 62590, Putrajaya Malaysia*

ABSTRACT

Introduction: Consumers are advised to read the nutrition labeling when purchasing packaged food. To what extent consumers read nutrition labeling and understand what they read is not well established among Malaysian older persons. **Methods:** Data from the National Health and Morbidity Survey III (NHMS III) undertaken in 2006 was analysed to determine the use and understanding of nutrition labeling and its associated factors among free living elderly men and women aged ≥ 60 years. Descriptive analysis and binary Logistic Regression were used to analyse the data. **Results:** A total of 4,898 respondents provided self-reported information on their use and understanding of nutrition labeling when they bought or received food. Use of nutrition labeling was higher among elderly men [61.9% (95% CI: 59.6-64.1)] than for women [36.6% (95% CI: 34.5-38.8)]. Nutrition labeling use was significantly associated with age, formal education, higher household income levels and marital status among both elderly men and women. Understanding of nutrition labeling among elderly men and women was 91.8% (95% CI: 90.1-93.2) and 89.7% (95% CI: 87.4-91.7) respectively and was significantly associated with formal education for both elderly men and women. **Conclusion:** Overall, the reading of nutrition labeling among Malaysian elderly is moderate. Elderly men and women with formal education were more likely to understand nutrition labeling. The importance of reading nutrition labels should be inculcated in consumers including older persons so that they choose foods that are nutritious and safe.

Key words: Nutrition information, nutrition labeling, older adults, socio-demography

INTRODUCTION

Nutrition labeling is a tool to provide factual information of nutrient content on the label of food packages (Tee, 1995 & Cowburn & Stockley, 2005) and is commonly used by consumers during food purchasing (Besler,

Buyuktuncer & Uyar, 2012 & Blistein & Evans, 2006). Nutrition labeling use encourages identifying healthier food when making food purchasing decisions (Ollberding, Wolf & Contento, 2010 & Grunert, Wills & Fernandez-Celamin, 2010). Greater adherence to nutrition labeling use

may reduce the negative impacts of unhealthy food intake such as total energy, saturated fat, and sugar intake which may increase the risk of chronic diseases.

The current prevalence of nutrition labeling use in most general populations is above 50% (Campos, Doxey & Hammond, 2011); 53.0% in the United States (Besler *et al.*, 2012), 72.3% in Turkey (Blistein & Evans, 2006), and 82.0% in New Zealand (Gorton *et al.*, 2009). Many studies suggest that nutrition labeling use is associated with education level, monthly household income, and marital status (Besler *et al.*, 2012, Gorton *et al.*, 2009, and Cruz-Gongora *et al.*, 2012). Education level is one of the most frequently reported determinants of use and understanding of nutrition labeling (Besler *et al.*, 2012, Ollberding *et al.*, 2010; Hess, Visscher & Siegrist, 2012). Besides, emerging research suggests that those who are currently married or living with a spouse are more likely to use nutrition labeling than those who are living separately or are widowed or divorced (Blistein & Evans, 2006; Godwin, 1996).

Older people are vulnerable to chronic diseases such as heart disease, cancer, hypertension, diabetes mellitus, stroke, and mental problems (Caughey *et al.*, 2008; Marengoni *et al.*, 2008). A Malaysian national study found that a total of 36.6% of the elderly aged 65-69 years old have diabetes (IPH, 2012). Increasing prevalence of use and understanding of nutrition labeling among the elderly population may help to reduce obesity and risk factors of diet-related chronic diseases (Ollberding *et al.*, 2010; Temple *et al.*, 2011). However, it has been found that the elderly experience difficulties in interpreting nutrition related information (Adznam *et al.*, 2009). Gaps in nutrition labeling knowledge and reading skills were found among older women aged 65-85 years old in the United States (Byrd-Bredbenner & Kiefer, 2000). Further, older aged elderly women were found to face more difficulties in interpreting nutrition

information on food labeling compared to younger aged elderly women (Byrd-Bredbenner & Kiefer, 2000).

Currently, there are very few studies on the pattern of use and understanding of nutrition labeling in the elderly population. In Malaysia, there is no published study on this topic among the elderly population. Thus, there is no reference on patterns of nutrition labeling use in Malaysian elderly population. The aims of this study are to describe the use and understanding of nutrition labeling among Malaysian elderly men and women aged 60 years old and above and to identify the association of socio-demography variables on the use and understanding of nutrition labeling. The findings of this study should provide a description of the pattern of use and understanding of nutrition labeling among elderly people.

METHODS

Study design and respondents

This study utilised data from The Third National Health and Morbidity Survey (NHMS III) (IPH, 2008). NHMS III is a nationwide cross-sectional study using two-stage random sampling design proportionate to population size throughout all states in Peninsular and East Malaysia (IPH, 2008). The protocol of NHMS III was reviewed and approved by the Medical Research Ethics Committee of Ministry of Health, Malaysia. The sampling frame was provided by Malaysian Department of Statistics. The country was divided into artificially created contiguous geographical areas called Enumeration Blocks (EB) as first-stage sampling unit. Each EB consisted of 80-120 living quarters (LQ). During first stage sample selection, EBs were randomly selected within each state. Then 10-12 LQs were randomly selected from each selected EB during second stage sample selection. A total of 2,150 EBs consisting of 17,251 LQs were recruited. All persons aged 18 years

and above who were living in the selected LQs were included in the study. Elderly aged 60 and above from the respective national survey were included in the statistical analysis.

Data collection was conducted from April to June 2006. A face-to-face interview questionnaire was developed in two languages (Malay and English) by the research team members. The questionnaire was designed to obtain information on socio-economic and demographic characteristics (age, gender, ethnicity, residential area, education levels, household income, and marital status), use and understanding of nutrition labeling.

Residential areas were categorised into rural or urban based on the criteria of the Department of Statistics, Malaysia. Education qualifications were categorised into four levels which were as follows: no formal education, primary education, secondary education, and tertiary education. Household income, which was total monthly household income, was classified into five categories: less than RM 400, RM 400- RM 999, RM 1000-RM 1999, RM 2000-RM 2999, and RM 3000 and above. Marital status was categorised into married, and not married/divorcee/widow/widower.

For the use and understanding of nutrition labeling, respondents were assessed by two questions which were "Do you read the nutrition labeling every time you buy or receive food (where applicable)?" and "Do you understand when reading the nutrition labeling every time you buy or receive food?" Both questions were provided with four responses which were "yes, always", "yes, sometimes", "never", and "don't know". In order to determine the prevalence of use and understanding of nutrition labeling, two answers of the questions which were "yes, always" and "yes, sometimes" were integrated into one category as "ever". Analysis about the understanding of nutrition labeling was limited to those who reported ever used it.

Statistical analyses

SPSS version 20 was used to perform data analysis. Data were weighted based on complex sample design. The proportion of socio-demographic characteristics and prevalence of use and understanding of nutrition labeling were analysed using descriptive statistics. Binary logistic regression analyses were used to determine the association between socio-demographic characteristics, use and understanding of nutrition labeling. Adjusted odds ratios were calculated with adjustment of covariates (age, residential areas, education levels, household incomes, and marital status). All statistical analyses were carried out at 95% confidence interval.

RESULTS

Socio-demographic characteristics of respondents

A total of 4,898 elderly respondents were included in this study and 4,429 (90.7%) completed the survey. The sample consisted of 48.1% (95% CI: 46.9-49.3) men and 51.9% (95% CI: 50.7-53.1) women. The socio-demographic characteristics of men and women are as shown in Table 1. The majority of the respondents were Malay [52.1% (95% CI: 49.5-54.7) for men and 51.5% (95% CI: 48.8-54.1) for women]. More than half of the respondents were living in urban areas [58.3% (95% CI: 55.3-61.1) for men and 55.9% (95% CI: 53.0-58.8) for women].

Prevalence and associated factors of nutrition labeling use among respondents

Table 2 shows the prevalence and associated factors of nutrition labeling use among elderly men and women by socio-demographic characteristics. Overall, prevalence of nutrition labeling use was higher in men [61.9% (95% CI: 59.6-64.1)] than women [36.6% (95% CI: 34.5-38.8)] regardless of socio-demographic profile. In general, men and women with younger age,

Table 1. Socio-demographic characteristic of respondents with weighted samples

Socio-demographic variables	Men (N = 789101)		Women (N = 851147)	
	n	% (95% CI)	n	% (95% CI)
Mean age \pm SD	68 \pm 0.1		68 \pm 0.2	
Ethnic Groups				
Malay	1129	51.5 (48.8-54.1)	1232	52.1 (49.5-54.7)
Chinese	611	30.8 (28.2-33.5)	634	29.9 (27.4-32.5)
Indian	127	6.5 (5.4-7.7)	166	7.8 (6.7-9.2)
Others	269	11.2 (9.9-12.7)	261	10.2 (9.0-11.6)
Residential areas				
Urban	1070	55.9 (53.0-58.8)	1207	58.3 (55.3-61.1)
Rural	1066	44.1 (41.2-47.0)	1086	41.7 (38.9-44.7)
Education Levels				
No Education	428	19.3 (17.6-21.1)	1192	51.2 (49.0-53.3)
Primary	1236	58.2 (56.0-60.5)	875	39.4 (37.3-41.6)
Secondary/ tertiary	443	22.5 (20.5-24.6)	192	9.4 (8.0-11.0)
Household Incomes				
<RM400	392	18.8 (17.1-20.6)	508	23.2 (21.4-25.1)
RM 400- RM999	668	32.8 (30.8-34.9)	641	29.6 (27.6-31.7)
RM 1000 - RM 1999	469	23.9 (22.0-25.9)	434	20.9 (19.1-22.8)
RM 2000 - RM 2999	234	12.1 (10.6-13.7)	239	11.7 (10.3-13.3)
\geq RM3000	233	12.4 (10.9-14.2)	294	14.6 (13.0-16.3)

N = estimated population

n = unweighted count

formal education (primary education level and secondary/tertiary education level), higher household income (RM400- RM999, RM1000-RM1999, and RM 2000- RM 2999), and being married were significantly more likely to read nutrition labels.

Prevalence and associated factors of understanding of nutrition labeling of respondents

Table 3 shows the prevalence and associated factors of understanding of nutrition labeling among elderly men and women who ever read nutrition labels. This study found that the majority of men [91.8% (95% CI: 90.1-93.2)] and women [89.7% (95% CI: 87.4-91.7)] reported always/sometimes understand the nutrition information. This study found that men and women with formal education were significantly more likely to report understanding of nutrition labeling as compared

to men and women without formal education. On the other hand, women with household income of between RM 400-RM 999 were also significantly more likely to understand the information in nutrition labels as compared to the women who fell in the group with household income < RM 400.

DISCUSSION

Use of nutrition labeling

The major findings of this study were: (1) respondents with younger age, formal education, higher household income levels, and being married were more likely to use nutrition labeling; (2) respondents with formal education were significantly more likely to understand nutrition labeling.

Overall, the prevalence of nutrition labeling use in this sample of elderly women (36.6%) was lower than men (61.9%).

Table 2. Prevalence and adjusted odds ratios for nutrition labeling use among elderly men and women

Socio-demographic variables	Men (N = 789101)				aOR	Women (N = 851147)				aOR
	Always/ sometimes read		Never read			Always/ sometimes read		Never read		
	n	% (95% CI)	n	% (95% CI)		n	% (95% CI)	n	% (95% CI)	
Prevalence	1277	61.9 (59.6-61.4)	820	38.1 (35.9-40.4)		792	36.6 (34.5-38.8)	1436	63.4 (61.2-65.5)	
Age	-	-	-	-	0.96 (0.95-0.98)*	-	-	-	-	0.93 (0.91-0.95)*
Residential areas										
Rural	574	54.9 (51.6-58.1)	475	45.1 (41.9-48.4)	1.00	499	27.6 (24.7-30.6)	622	72.4 (69.4-75.3)	1.00
Urban	703	67.5 (64.3-70.5)	345	32.5 (29.5-35.7)	1.13 (0.90-1.43)	293	43.3 (40.3-46.4)	774	56.7 (53.6-59.7)	1.24 (0.97-1.58)
Education Levels										
No Education	102	26.0 (21.9-30.6)	314	74.0 (69.4-78.1)	1.00	169	14.9 (12.8-17.3)	986	85.1 (82.7-87.2)	1.00
Primary	790	64.3 (61.3-67.2)	436	35.7 (32.8-38.7)	4.40 (3.30-5.85)*	456	52.6 (49.2-55.9)	411	47.4 (44.1-50.8)	4.97 (3.92-6.29)*
Secondary/tertiary	374	85.5 (81.8-88.6)	65	14.5 (11.4-18.2)	12.36 (8.29-18.44)*	161	85.1 (78.9-89.8)	29	14.9 (10.2-21.1)	20.15 (12.42-32.70)*
Household Incomes										
<RM400	158	41.9 (37.0-46.9)	231	58.1 (53.1-63.0)	1.00	106	22.6 (19.0-26.6)	391	77.4 (73.4-81.0)	1.00
RM 400- RM999	399	61.6 (57.7-65.4)	258	38.4 (34.6-42.3)	1.61 (1.20-2.16)*	226	36.7 (32.7-40.9)	401	63.3 (59.1-67.3)	1.58 (1.16-2.14)*
RM 1000 -RM 1999	321	70.3 (65.8-74.5)	138	29.7 (25.5-34.2)	1.81 (1.31-2.51)*	164	39.6 (34.8-44.5)	256	60.4 (55.5-65.2)	1.34 (0.95-1.90)
RM 2000 -RM 2999	159	70.6 (64.1-76.3)	67	29.4 (23.7-35.9)	2.00 (1.33-3.02)*	104	45.8 (39.4-52.3)	127	54.2 (47.7-60.3)	1.77 (1.19-2.63)*
≥ RM3000	156	67.9 (61.4-73.8)	73	32.1 (26.2-38.6)	1.48 (0.96-2.27)	134	47.7 (42.1-53.3)	151	52.3 (46.7-57.9)	1.77 (1.23-2.55)*
Marital Status										
Not Married/ divorcee/widow/ widower	86	43.5 (36.8-50.4)	123	56.5 (49.6-63.2)	1.00	303	29.2 (26.6-32.1)	764	70.8 (67.9-73.4)	1.00
Married	118	64.1 (61.7-66.4)	691	35.9 (33.6-38.3)	1.84 (1.27-2.68)*	486	43.5 (40.4-46.7)	665	56.5 (53.3-59.6)	1.28 (1.03-1.60)*

N = estimated population n = unweighted count; * significant (*OR > 1) reference = never use.

aOR = adjusted odds ratios (adjusted for age, residential areas, education levels, household incomes, and marital status).

Table 3. Prevalence and adjusted odds ratios for understanding of nutrition labeling among elderly men and women

Socio-demographic variables	Men (N = 4779001)				^a OR	Women (N = 300907)				
	Always/ sometimes understand		Never understand			Always/ sometimes understand		Never understand		^a OR
	n	% (95% CI)	n	% (95% CI)		n	% (95% CI)	n	% (95% CI)	
Prevalence	1166	91.8 (90.1-93.2)	105	8.0 (6.6-9.8)	1.00 (0.96-1.04)	705	89.7 (87.4-91.7)	81	10.1 (8.1-12.4)	1.01 (0.96-1.06)
Age	-	-	-	-		-	-	-	-	
Residential areas										
Rural	518	90.2 (87.3-92.6)	56	9.8 (7.4-12.7)	1.00	253	87.7 (83.0-91.2)	37	12.3 (8.8-17.0)	1.17 (0.69-1.96)
Urban	654	93.1 (90.8-94.8)	49	6.9 (5.2-9.2)	1.31 (0.83-2.07)	452	90.6 (87.6-92.9)	46	9.4 (7.1-12.4)	1.00
Education Levels										
No Education	82	81.3 (72.8-87.6)	19	18.7 (12.4-27.2)	1.00	136	82.4 (75.5-87.7)	31	17.6 (12.3-24.5)	1.00
Primary	721	91.4 (89.2-93.3)	69	8.6 (6.7-10.8)	2.53 (1.38-4.64)*	405	88.8 (85.4-91.5)	49	11.2 (8.5-14.6)	1.79 (1.03-3.12)*
Secondary/tertiary	358	95.8 (93.2-97.4)	16	4.2 (2.6-6.8)	4.97 (2.21-11.20)*	158	98.2 (94.5-99.4)	3	1.8 (0.6-5.5)	12.36 (3.62-42.20)*
Household Incomes										
<RM400	135	87.3 (81.2-91.6)	21	12.7 (8.4-18.8)	1.00	86	80.2 (71.5-86.7)	21	19.8 (13.3-28.5)	1.00
RM 400- RM999	365	91.6 (88.5-94.0)	35	8.4 (6.0-11.5)	1.31 (0.72-2.40)	203	90.9 (85.9-94.2)	21	9.1 (5.8-14.1)	2.35 (1.13-4.91)*
RM 1000- RM 1999	298	92.8 (89.4-95.2)	23	7.2 (4.8-10.6)	1.31 (0.68-2.52)	146	90.1 (84.5-93.8)	17	9.9 (6.2-15.5)	1.68 (0.79-3.58)
RM 2000- RM 2999	151	93.8 (88.4-96.8)	10	6.2 (3.2-11.6)	1.55 (0.68-3.51)	93	90.2 (82.8-94.7)	10	9.8 (5.3-17.2)	1.84 (0.78-4.35)
≥ RM3000	148	94.9 (90.0-97.4)	8	5.1 (2.6-10.0)	1.66 (0.66-4.15)	121	90.5 (84.0-94.6)	18	9.5 (5.4-16.0)	1.73 (0.75-4.00)
Marital Status										
Not Married/ divorcee/ widow/ widower	79	92.2 (84.5-96.3)	7	7.8 (3.7-15.5)	1.18 (0.47-2.96)	268	90.0 (86.1-92.9)	31	10.0 (7.1-13.9)	1.32 (0.78-2.23)
Married	1091	92.0 (90.3-93.5)	97	8.0 (6.5-9.7)	1.00	435	89.5 (86.3-92.1)	51	10.5 (7.9-13.7)	1.00

N = estimated population n = unweighted count; * significant (^aOR > 1) reference = never understand.

^aOR = adjusted odds ratios (adjusted for age, residential areas, education levels, household incomes, and marital status).

According to this finding, the prevalence of nutrition labeling use among elderly men (61.9%) was comparable to the elderly population in rural Southern United States (63.0%) (Byrd-Bredbenner & Kiefer, 2000). A previous study in Malaysia found that men were more likely to use printed media to be their nutritional information source as compared to women as majority of the elderly women had only received informal education (Adznam *et al.*, 2009). This finding could be the reason why a higher percentage of men reported nutrition labeling use.

Use of nutrition labeling also varied between different socio-demographic subgroups. This study found that the likelihood of using nutrition labeling was lower among older aged elderly men and women. Several previous studies reported similar findings especially among those aged 81 and older who used nutrition labeling the least (Macon *et al.*, 2004; Elbon *et al.*, 2000). The older aged elderly may be functionally impaired, for instance, having poor vision, which would make it difficult to read the small sized letters on the food labels (Aygen, 2012). Besides, nutrition labels may not be the preferred source of nutrition information in their daily life as elderly were less likely to be household food shoppers. Adznam *et al.* (2009) found that the most preferred nutrition education sources among the elderly were talks, counseling sessions, and electronic media such as television and radio.

The majority of women without formal education [85.1% (95% CI: 82.7-87.2)] reported that they never read nutrition labels. Elderly men and women with formal education were significantly more likely to use nutrition label as compared to elderly without formal education. This finding is supported by a previous study which reported that the elderly who had higher education levels tend to have better nutrition knowledge and faced fewer difficulties in understanding nutrition information on the labels (Lin & Lee, 2005). A previous study

revealed that elderly people with lower education level may face more barriers to understand the nutrition information on the food packages and less interest to use the nutrition labeling (Campos *et al.*, 2011).

Respondents with lower household income (< RM 400) were less likely to use nutrition labeling than those with household income \geq RM 400. These findings are consistent with recent studies which highlight that the population with lower income tend to be less likely to use nutrition label due to a lack of shopping habits and absence of the nutrition labels on the low-cost food they purchase (Besler *et al.*, 2012 & Signal *et al.*, 2007). The findings could explain the barriers the elderly with lower income encounter when using nutrition labeling.

This study also found that married respondents were significantly more likely to use nutrition labeling as compared to those who were not married/ divorced/ widowed. This was noted in other studies which found higher nutrition labeling use among those who were married (Besler *et al.*, 2012; Blistein & Evans, 2006; Godwin, 1996). Why do married elderly use nutrition labeling more frequently than unmarried or divorced and widowed elderly? One reason maybe that married elderly are the food shoppers for the household and they need the nutrition information on nutrition labels for food purchasing decision making (Byrd-Bredbenner & Kiefer, 2000).

Understanding of nutrition labeling

Although the rate of nutrition labeling use was lower than other populations, the majority of the nutrition labeling users (91.8% for men and 89.7% for women) always/ sometimes understand nutrition labeling when buying or receiving food especially the higher educated group. Understanding of nutrition labeling is probably over-reported as compared to previous studies. In order to reduce the bias, assessment of ability at interpreting nutrition

labeling using a replicated nutrition labeling format is recommended in future studies.

This study showed that understanding of nutrition labeling is only significantly associated with education levels. Elderly men and women with formal education were more likely to understand nutrition labeling as compared to elderly without formal education. According to the literature, understanding of nutrition labeling is associated with literacy (Lin & Lee, 2005). Elderly with poor literacy may face more barriers in reading nutrition information on the food labeling (Blistein & Evans, 2006; Campos *et al.*, 2011). A study in Malaysia found that more than half of the Malaysian elderly (59.5%) in rural areas have insufficient knowledge about nutrition (Adznam *et al.*, 2009). Nutrition knowledge could be the main element of understanding nutrition labeling and education could be the main requirement for having higher nutrition knowledge among the elderly (Lin & Lee, 2005). Better comprehension of nutrition information is related to higher levels of education and income (Campos *et al.*, 2011; Lisa *et al.*, 2010; Grunert *et al.*, 2010).

This study found that elderly women with household incomes of between RM 400-RM 999 were significantly associated with understanding of nutrition labeling. This finding is not comparable with most of the literature. However a systematic review reported that although self-reported understanding is generally high among lower-income groups, most of them showed poor performance on ability to use the nutrition label (Campos *et al.*, 2011). Hence, lower income groups may have higher self-reported understanding of nutrition labeling but it may not indicate better nutrition information comprehension. In order to prevent over-reporting among elderly with lower income, a practical test to evaluate their skills at interpreting nutrition labeling is suggested in the future study.

Education programmes for the elderly must be planned to create awareness of

reading nutrition information on food packages using their preferred mass media such as electronic media, talks, and counseling. A modified format of nutrition labeling is recommended such as using standardised serving sizes and simplified nutrition information with understandable words or consumer-friendly symbols are needed to improve better interpretation of nutrition information. Future research to determine influence of other factors such as interest on nutrition information, comprehension of types of nutrition information, and beliefs in good nutrition are strongly recommended for education programme planning to promote healthy dietary practices among the elderly population in Malaysia.

Limitations and strengths of the study

This nationally representative study is valuable as the findings provide a better view of nutrition labeling use pattern among the Malaysian elderly population. However, it has identified the need to improve the use and understanding of nutrition labeling among Malaysian elderly. The cross-sectional study is not conclusive on the causal relationship between use and understanding of nutrition labeling and socio-demographic variables. Since this is a self-reported study, there is a tendency for respondents to over or under-report the use of nutrition labeling and understanding of nutrition labeling.

CONCLUSION

In conclusion, the prevalence of nutrition labeling use is moderate and prevalence of understanding of nutrition labeling is high among the Malaysian elderly. Those of younger ages among the elderly, being married, with formal education, and higher household income levels were significantly more likely to use nutrition labeling. Education was significantly associated with understanding of nutrition labeling among

elderly men and women. The importance of reading nutrition labels should be inculcated in consumers including the elderly so that they choose foods that are nutritious and safe.

ACKNOWLEDGEMENTS

The authors would like to thank the Director General of Health of Ministry of Health, Malaysia for permission to publish this paper. The authors also would like to thank the members of the National Health and Morbidity Survey 2006 teams for making this survey a success. Funding for this research was provided by the Ministry of Health Malaysia.

REFERENCES

- Adznam SN, Shahar S, Rahman SA, Yusof NAM, Arshid F, Yassin Z, Salleh M, Samah AA, & Sakian NIM (2009). An action research on promotion of healthy ageing and risk reduction of chronic disease: a needs assessment study among rural elderly Malays, care givers and health professionals. *J Nutri Health Aging* 1(10): 925-930.
- Aygen FG (2012). Determinants of nutrition label use among Turkish consumers. *Int J Hum Soc Sci* 2(7): 53-70.
- Besler HT, Buyuktuncer Z & Uyar MF (2012). Consumer understanding and use of food and nutrition labeling in Turkey. *J Nutr Educ Behav*. Doi: 10.2016/j.jneb.2012.01.005.
- Byrd-Bredbenner C & Kiefer L (2000). The ability of elderly women to perform nutrition facts label tasks and judge nutrient content claims. *J Nutr Elder* 20(2): 29-46.
- Blitstein JL & Evans WD (2006). Use of nutritional facts panels among adults who make household food purchasing decisions. *J Nutr Educ Behav* 38: 360-364.
- Caughey GE, Vitry AI, Gilbert AL, Roughead EE (2008). Prevalence of comorbidity of chronic diseases in Australia. *BMC Public Health* 8: 221.
- Campos S., Doxey J, Hammond D (2011). Nutrition labels on pre-packaged foods: a systematic review. *Pub Hlth Nutr* 14(8): 1946-1506.
- Cowburn G & Stockley L (2005). Consumer understanding and use of nutrition labelling: a systematic review. *Pub Hlth Nutr* 8: 21-28.
- Cruz-Góngora VD, Villalpando S, Rodríguez-Oliveros G, Castillo-García M, Mundo-Rosas V, and Meneses-Navarro S (2012). Use and understanding of the nutrition information panel of pre-packaged foods in a sample of Mexican consumers. *Salud Publica Mex* 54:158-166.
- Elbon SM, Johnson MA, Fischer JG & Searcy C (2000). Demographic factors, nutrition knowledge, and health-seeking behaviours influence nutrition label reading behaviours among older American adults. *J Nutr Elder* 19(3): 31-48.
- Godwin SL (1996). Usage of nutrition labels by rural southern elderly. *J Am Diet Assoc* 96 (9): Suppl: 101.
- Gorton D, Mhurchu CN, Chen MH & Dixon R (2009). Nutrition labels: a survey of use, understanding and preferences among ethnically diverse shoppers in New Zealand. *Pub Hlth Nutr* 12(9): 1359-1365.
- Grunert KG, Wills JM & Fernandez-Celemin L (2010). Nutrition knowledge, use and understanding of nutrition information on food labels among consumers in the UK. *Appetite* 55 (2): 177-189.
- Hess R, Visscher VHM & Siegrist M (2012). The role of health related, motivational and socio-demographic aspects in predicting food label use: a comprehensive study. *Pub Hlth Nutr* 15(3): 407-414.
- Institute for Public Health (2008). The Third National Health and Morbidity Survey (NHMS III), Methodology. Ministry of Health Malaysia, Kuala Lumpur.
- Institute for Public Health (2012). National Health and Morbidity Survey 2011, Non Communicable Diseases. Ministry of Health Malaysia, Kuala Lumpur.
- Lin W & Lee Y-W (2005). Nutrition knowledge, attitudes, and dietary restriction behavior

- of the Taiwanese elderly. *Asia Pac J Clin Nutr* 14(3): 221-229.
- Lisa M, Soederberg M, Tanja NG & Elizabeth AA (2010). Predictors of nutrition information comprehension in adulthood. *Patient Educ Couns* 80: 107-112.
- Macon JF, Oakland MJ, Jensen HH & Kissack PA (2004). Food label use by older Americans. *J Nutr Elder* 24(1): 35-52.
- Marengoni A, Winblad B, Karp A & Fratiglioni L (2008). Prevalence of chronic diseases and multimorbidity among the elderly population in Sweden. *Am J Public Health* 98 (7): 1198- 1200.
- Ollberding NJ, Wolf RL & Contento I (2010). Food label use and its relation to dietary intake among US adults. *J Am Diet Assoc* 1233- 1237.
- Signal L, Lanumata T, Robinson JA, Tavila A, Wilton J & Mhurchu CN (2007). Perceptions of New Zealand nutrition labels by Maori, Pacific and low income shoppers. *Pub Hlth Nutr* 11(7): 706-713.
- Tee E-S (1995). Nutrition labeling in Malaysia. Proceedings. Third Asia Pacific Food Analysis Network. Food and Nutrition Research Institute, Manila, Philippines: 214-216.
- Temple JL, Johnson K, Recupero K, Suders H (2011). Nutrition labels decrease energy intake in adults consuming lunch in the laboratory. *J Am Diet Assoc* 111: S52-S55.