

MEAT PRODUCT INTAKES AND THEIR RELATIONSHIP TO DIETARY RISK PERCEPTIONS IN TAIWAN

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Abstract – In this study, one thousand survey participants were surveyed as the part of the NAHSIT (Nutrition and health survey in Taiwan) database. The major purpose was focused on whether the meat intake of participants was related with their dietary risk perception. The results showed that there were 2.9 servings of livestock lean meat (LM) intake in average, 1.8 servings of poultry meat (PM), and 1.0 serving of fatty livestock meat (FLM) per week. More than two thirds of the participants consumed FLM (79.3%) less than once in a week. However, participants more often chose LM or PM than FLM, and 51% and 26.7% of the participants consumed LM or PM more than three times per week. Even though most participants paid more attention to their diet pattern in recent years, there remained a lack of understanding of some significant nutritional properties of meat. Only one third could recognize that red meat had higher iron content than that of white meat (30%) as well as poultry meat had higher protein content than poultry soup (40%). Therefore, to promote the public's healthy understanding of meat, greater efforts to educate consumers will be necessary in the future.

Key Words – dietary intake, meat, survey.

I. INTRODUCTION

A food supply and utilization statistics document from the “Taiwan Food Balance Sheet” [1] has recorded that per capita per day energy supply of meat was 216.3 grams and 370 Kcal. This ratio is higher than those of neighboring countries in Asia. During the same period, the nutrition researchers had investigated dietary surveys for many years in Taiwan. Especially nutritionists have mentioned several nutritional deficiency problems in the Taiwanese. A previous study indicated that pork was the most commonly consumed meat in Taiwan [2]. Many studies have demonstrated that dietary intake can lead to several diseases [3, 4]. Available information on the meat needs more display. The

objective of this study was to demonstrate the relationship between meat intakes and dietary concepts. Information would be applied to people's nutrition education and dietary guidance in the future.

II. MATERIALS AND METHODS

Participant design

Participants' data were quoted from the part of the “Nutrition and Health Survey in Taiwan” database of 2004-2008, which was released from the Survey Research Data Archive. The first step report was published on the government web site by Pan and Tu [5]. The 1000 individuals were 19 to 102 years of age. After checking and deduction of 28 abnormal data, several data columns were captured into this research, including age, gender and meat intake frequency. Questionnaires were compared between the dietary concepts and general eating habits (this item was only compared within those 19-64 years of age).

Nutrient intakes record & questionnaire topics

Dietary nutrient intakes were assessed by the 24-hour recall method. General eating habits were obtained from eight question original scores, and converted into the levels of dietary risk; the higher the score meant the higher risk. The four questions of diet concepts were compared to the characteristics by using equal amount of each food. It was regarded as one score when participants selected the correct answer. The questionnaire instructions were summarized in Table 1.

Statistical analysis

Data were processed by using matrix diagram and principal components model of Minitab vision 15.1 statistic programs.

Table 1. Questionnaire composition, responses of eating habits and diet concept.

General eating habits*
Q1. How often do you eat marinade with noodles or rice?
Q2. How often do you eat poultry with skin or fat?
Q3. How often do you eat livestock with skin or fat?
Q4. Do you eat stew meat or roast instead of fry?
Q5. Do you eat lean pork instead belly or hock?
Q6. Do you eat fried poultry and livestock meat?
Q7. Do you eat poultry meat instead livestock meat?
Q8. Do you always eat a little meat?
*1. Removal of participants over the age of 65
*2. The scale ranges from ‘never true=5’ to ‘always true=1’, and converted scale into risk level, with higher scores indicating greater risk.
Diet concepts**
Q1. Which food contained higher calories? (hock, loin, ham)
Q2. Which food contained higher cholesterol? (peanut oil, soybean oil, lard)
Q3. Which food contained higher iron? (chicken, fish, pork)
Q4. Which food contained higher protein? (chicken, chicken soup, just as much)
**1. Multiple-choice questions, correct answers to give 1 point.

III. RESULTS AND DISCUSSION

Different meat intake frequency between PM and LM is shown in Table 2. LM was consumed 2.9 times per week, PM 1.8 times and FLM 1.0 time. Nearly 51 % and 26.7% of participants had intake above 3 serving per week of LM and PM. However, more than 44.2% of participants did not eat FLM within a month. The meat intake frequency of women was lower than that of men, when either PM or LM or even FLM was considered. It was noticed that most of participants now paid great attention to their diet pattern. As demonstrated by Wu *et al.* [6], it was indicated that citizens aged from 19 to 64 years old consumed up to 9 and 6 servings (30 g per portion) of meat for women and men, respectively. Researcher groups are concerned not only by the high protein intake but also cholesterol intake as these would be closely associated with increasing risk of cardiovascular disease [7]. It should be noted that pork, with a daily intake of 3 servings provided more than the national recommended amount of Dietary Reference Intakes (DRIs). Similar results [8] were also recorded in children, however, it was pointed out that too many children had high meat intake when compared to the national dietary guidelines. A recent report indicated that

more than 53% of Taiwanese eat meat per meal or per day, and more than 85% of people like pork [4].

Through a long term survey, Taiwan nutrition researchers have observed iron deficiency in the population. Based on the fact that meat is an important source of iron, this study also discussed participant dietary concepts related to meat intake. Together, Figures 1 and 2 showed that only one third of participants knew that red meat contained higher iron contents than that of white meat (shown as blue triangles). Additionally, only 40% could understand that poultry meat protein was higher than that of stewed chicken soup. From the results of Figures 1 and 2, more people answered two answers correctly and it showed that people had a better understanding of calories and cholesterol than iron and protein. In addition, people’s knowledge of nutrition was not at all clear. Overall, observations from the regression curve results did not find a relationship between meat intake frequency and the ratio of correct answers. However, the scree plots diagram may be able to provide further analysis of the interaction between the various factors. Thus, for more study on the iron and protein knowledge of meat, scree plots of the matrix diagram were used to generate statistics for the relationship between various characteristics.

As the results show (Fig. 3 and Table 3), three major factors (gender, age, general eating habits risk) with eigen-values greater than 1 were obtained. This was an important evidence for the investigation of relevant survey. In first step report, Wu *et al.* [8] indicated that nearly 50% of females aged from 9 to 50 years old and those above 71 years old had iron intake lower than the DRI recommendations. In particular in the heme-iron (poultry, livestock, meat and fish and other foods containing iron) intakes, amounts of elderly men and women over the age of 65 were significantly lower. Similarly in this study, individual component analysis indicated that parameter “general eating habits risk” had a higher relationship with PC7 (-0.620). This means that people who had the higher dietary risk had insufficient knowledge of iron sources.

However, higher PM intake was associated with PC8 (0.659), and it means the higher PM intake people had more correct answer of protein sources. It was also found that there were some negative interactions between LM intakes with PC7 (-0.475) and PC8 (-0.475). People who had higher number of the LM intake gave more wrong answers. This might be because many people often believe that chicken soup is nutritious according to the traditional habits, and overlooked the nutrition of the chicken meat portion.

Table 2. Intake frequency of poultry and livestock meat per week by gender.

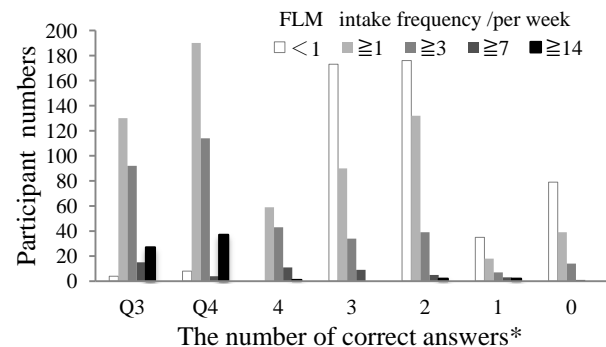
1. PM (chicken, duck, goose; Avg. intake frequency =1.8)							
Person	Intake frequency of meat within a week (times)						
	0	<1	<2	<3	<5	<10	>10
Male	67	153	105	66	48	38	2
Female	85	210	92	46	33	22	5
Total	152	363	197	112	81	60	7
Total %	15.6	37.4	20.3	11.5	8.3	6.2	0.7
2. LM (pork, beef, lamb; Avg. intake frequency = 2.9)							
Person	Intake frequency of meat within a week (times)						
	0	<1	<2	<3	<5	<10	>10
Male	76	78	66	79	77	95	8
Female	106	90	80	71	51	85	10
Total	182	168	146	150	128	180	18
Total %	18.7	17.3	15.0	15.4	13.2	18.5	1.9
3. FLM (pork hock, pork knuckle, ground belly, marbling beef, hamburger meat, steamed buns meat, dumpling meat; Avg. intake frequency = 1.0)							
Person	Intake frequency of meat within a week (times)						
	0	<1	<2	<3	<5	<10	>10
Male	179	170	45	33	22	24	6
Female	251	171	26	20	8	15	2
Total	430	341	71	53	30	39	8
Total %	44.2	35.1	7.3	5.5	3.1	4.0	0.8

Table 3. Results of principal component analysis between varieties characteristics.

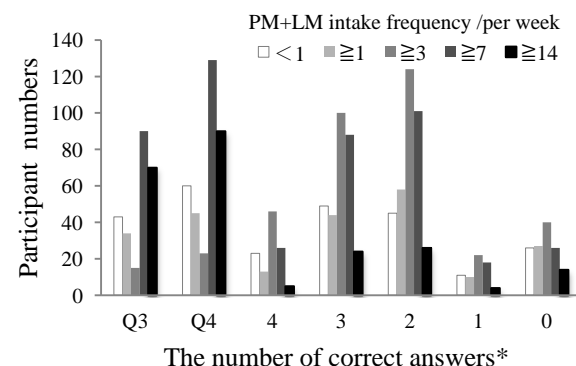
Variance	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
Eigen value								

	2.03	1.27	1.09	1.00	0.83	0.70	0.63	0.45
% of variance	0.25	0.16	0.14	0.13	0.11	0.09	0.08	0.06
Cumulative value	0.25	0.41	0.55	0.67	0.78	0.87	0.94	1.00
gender	0.24	0.60	-0.21	0.151	0.50	0.28	-0.32	0.32
age	0.33	-0.27	-0.02	0.74	-0.13	0.14	-0.23	0.43
GEH*	-0.33	-0.45	0.32	-0.34	0.11	0.16	-0.62	0.21
PM	-0.53	0.20	-0.17	0.01	-0.15	-0.42	0.13	0.66
LM	-0.44	0.16	-0.34	0.43	0.10	-0.15	-0.48	-0.48
FLM	-0.48	-0.01	-0.08	0.16	0.02	0.79	0.35	0.04
Iron*	0.15	-0.15	-0.69	-0.34	-0.54	0.18	-0.19	0.03
Protein*	0.02	-0.54	-0.47	-0.03	0.64	-0.16	0.24	0.05

*GEH: means general eating habits risk; Iron: means correct answer of diet concepts; Protein: means correct answer of diet concepts.



*Questions of Q3 and Q4 were shown as Table 1.
Fig. 1 Relationship between fatty livestock meat (FLM) intake frequency and diet concepts.



*Questions of Q3 and Q4 were shown as Table 1.
Fig. 2 Relationship between poultry meat (PM) and livestock meat (LM) intake frequency and diet concepts.

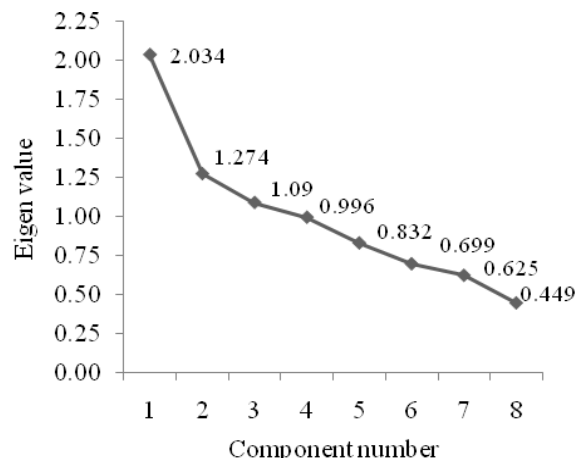


Fig. 3 Scree plots of the matrix diagram showing the relationship correlation between varieties characteristics.

From the results of this study, meat intakes could be interacted with the gender, age and also general eating habits. Other topics of effects on diet concept should be noted in further research.

IV. CONCLUSION

In conclusion, most of the people in Taiwan consume more red meat, especially pork, than poultry and other meats. In addition, participants showed an insufficient knowledge on iron and meat protein information and this should be improved by nutritional educational activities.

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