

A Study on Intake Level of Mono Sodium Glutamate in Korea*

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韓國人の 글루타민산나트륨 攝取量에 관한 研究

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要 約

1. 本 調査研究는 1,000家口를 韓國의 4大都市인 서울, 釜山, 大邱, 光州 地域에서 3段階 標本抽出 方法으로 選擇하여 이들의 1人1日 Mono Sodium Glutamate(MSG) 攝取量을 包含한 使用實態를 調査한 것이다.
2. 調査結果에 의하면 韓國人 1人1日 平均 攝取量은 1.57 g 이었고, 攝取量의 分布는 1.57 g 以下가 全體家口의 62.8 %, 1.58~2.57 g 가 21.5 %, 그리고 2.58~3.57 g 을 攝取하는 家口가 8.7 %로 나타났다.
3. 地域別 平均 攝取量은 大邱地方이 가장 높았고(2.06 g), 이어서 光州(1.80 g), 서울(1.55 g) 및 釜山(1.48 g) 의 順序로서 全體的으로 地域間에 큰 差異는 없었다.

I. Introduction

It is noted consumers' increasing concern about the problem of health is being focused on what they eat as the level of their incomes continues to improve today.

In constant pursuit of better taste, a growing quantity of food additives is consumed in

cooking at home and also for industrially processed foods with the matter of their safety coming to the fore as a result. ⁽¹⁾

Despite of the hard fact that such food additives are carefully assessed regarding their safety in the first place by many experts of the authorized institutions worldwide prior to general consumption, disputes have been brought up at times by some consumer's organiza-

*This research was performed by request of The Korean Women Association

tions.

Since the increased use of food additives is inevitably related to the safety for the human body, the disputes between the consumer groups and producers over the consumption level in the form of foods originates from the very reason.

In this study, surveys were conducted on the processed foods whose consumptions are steadily on the increase in recent years, particularly regarding the consumption, motivation of purchase and usage pattern of baby foods, processed meat products and edible oil. However, the report is confined to the matters related to monosodium glutamate (MSG).

As is well known, MSG is an excellent flavor enhancer as one of the food additives currently in extensive use worldwide(2.3.4.5). In the case of Korea, producing and exporting the second largest amount of MSG in the world after Japan based on fermentation process, it constitutes one of the nation's most important industrial sector. Today, most of the Korean housewives use MSG in cooking foods as if they were using their traditional condiments such as soy sauce, salted guts of fish, garlic and powdered hot pepper (6).

Containing one of the most vital amino acids, it is reported, MSG is present not only as an intermediate metabolite in the human body but also as glutamic acid either in combination or in free state in the tissues of animals and plants(7).

II. Methods

Densely-populated four major cities (Seoul, Pusan, Taegu and Kwangju) were selected for

this study. Parent population includes 1000 families. Housewives in age of twenty were chosen among the middle or low-income level residing in the above four cities. Subjected families were screened randomly by the three-stage proportional sampling method (8) based on the principle of probability sampling as follows.

First stage is classified as "dong" which is the smallest administrative unit in Korea, second stage as "tong" and "ban" (subunits of "dong") and third stage as household (family).

Respondents were housewives who are the mostly involved in buying activities and use of the product. To study the consumer's attitude and actual usage condition of MSG, well-trained investigators made the personal interviews by visiting individual house wives.

The direct consumption amount of MSG was examined by estimating the weight of MSG before and after investigation.

The indirect consumption amount was investigated by estimating the amount contained in the compound seasoning or the processed foods which had been consumed in the respondent's home at the span of same period.

The direct intake level was calculated by subtracting from the direct consumption investigated the diet being discarded as remnants in terms of MSG at each meal and food service. The indirect intake level was calculated by measuring the diet being discarded in terms of MSG at each meal as remnants of the direct consumption investigated in the respondent's home and by subtracting the MSG contained therein from the direct consumption. Survey area is shown in table 1.

Table 1. The survey area of research

(unit : number of household)

Content	Area	Seoul	Pusan	Taegu	Kwangju	Total
No. of samples		400	200	200	200	1000
Completed questionnaire		400	200	200	200	1000
Completion rate (%)		100	100	100	100	100
Investigation period ('86)						
-First		Feb 4-6	Feb 5-7	Feb 5-7	Feb 12-14	Feb 4-26,
-Second		Feb 12-14	Feb 12-14	Feb 12-14	Feb 17-19	
-Third		Feb 17-19	Feb 17-19	Feb 17-19	Feb 24-26	
No. of interviewers		20	10	10	10	50
Average interviews per person per day		2.2	2.2	2.2	2.2	8.8

To confirm the reliability of the investigation, the questionnaire was thoroughly inspected. Whenever incomprehensible data were detected the investigator being in charged used to repeat review works.

All statistics data obtained and analyzed by Korean Statistics System Computer Center, and the survey works of the data were supported by The Korean A.C. Nielson Co.. Body weight was calculated from "Fourth Revised Nutrition Investigation by Koreans"(April. 25, 1985) published by The Ministry of Health & Social Affairs. The amount of MSG in foods were calculated from "MSG Contents in Foods; 80 Samples" published by The Institute of Nutrition Problem in Korea University.

1000 house wives were interviewed in Seoul, Taegu, Pusan and Kwangju, respectively, for three weeks starting from February 4 to February 26, 1986 by fifty expert investigators.

Investigators were selected from undergraduate and graduate girl students who had experienced in the research centers.

Investigators attended to a two day orienta-

Table 2. Demographic structure of the respondents

Classification	No. of respondent	Ratio (%)
Total ;	1000	100.0
A. Age ;		
20 -29	149	14.9
30 -39	323	32.3
40 -49	329	32.9
Over 50	199	19.9
B. Education ;		
Elementary education	229	22.9
Middle school	304	30.4
High school	360	36.0
Above college	107	10.7
C. Monthly income ; (₩10,000)		
Below 20	210	21.0
20 -39	438	43.8
40 -59	247	24.7
60 -79	63	6.3
Above 80	42	4.2
D. Area ;		
Seoul	400	40.0
Pusan	200	20.0
Taegu	200	20.0
Kwangju	200	20.0

tion course on MSG supervised by The Institute of Nutrition Problem in Korea University followed by joining in the second orientation course for one day at the Korean Branch Office of A.C. Nielson Research Co., a world famous marketing research organization. After finishing interview investigators conducted home visit interviews in accordance with their family directory.

III. Result

The age distribution of respondents showed

the largest portion of 40's (32.9 %) followed by 32.3 % of 30's and 19.9% of 40's in order. The 20's took the smallest portion (14.9 %).

Educational background were disclosed as being composed of high school education (30.4 %), elementary (22.9%) and over college graduation (10.7%) in order.

Meanwhile, monthly income level was composed of 200,000–300,000 won bracket (43.8%) followed by below 200,000 won group (21.0%), 600,000–790,000 won group (6.3%) over 800,000 won group (4.2%) in order. From the data below 600,000 won income level group

Table 3. Distribution of necessity on usage of MSG

Classification	No. of respondent	(unit : %)				
		Necessary	Case by case	Not necessary	No answer	Total
Total ;	(999)	67.9	29.1	1.4	1.6	100.0
A. Age ;						
20 –29	(149)	62.4	33.6	1.3	2.7	100.0
30 –39	(323)	72.5	24.5	1.5	1.5	100.0
40 –49	(328)	65.9	31.1	1.5	1.5	100.0
Over 50	(199)	67.8	30.2	1.0	1.0	100.0
B. Education;						
Elementary education	(229)	79.1	17.5	1.7	1.7	100.0
Middle school	(304)	78.6	18.4	0.0	3.0	100.0
High school	(359)	61.6	35.9	1.9	0.6	100.0
Above college	(107)	34.6	61.7	2.8	0.9	100.0
C. Monthly income ; (₩10,000)						
Below 20	(210)	71.9	26.2	0.5	1.4	100.0
20 –39	(438)	73.0	23.1	1.8	2.1	100.0
40 –59	(246)	63.5	34.1	1.2	1.2	100.0
60 –79	(63)	55.5	39.7	3.2	1.6	100.0
Above 80	(42)	38.1	61.9	0.0	0.0	100.0
D. Area ;						
Seoul	(400)	65.7	32.5	1.0	0.8	100.0
Pusan	(199)	59.8	34.2	2.5	3.5	100.0
Taegu	(200)	68.0	29.5	1.0	1.5	100.0
Kwangju	(200)	80.0	17.0	1.5	1.5	100.0

were accounted for 89.5%. The result of this investigation were recapitulated as follows.

1. Usage pattern of MSG consumption

Research findings on actual condition of MSG consumption are follows (Table 3). In case of housewife's opinions upon the necessity for MSG most of them (87.9%) thought that it is necessary to flavor the food, and only 1.4% of them denied its necessity.

Among the age level groups and residential area groups, there were not much different opinions upon the MSG. However, in case of higher

educated and higher income group, necessity of MSG rate was getting lower. 34.6% of college graduated housewives, and 38.1% of high income level group who spend more than 800,000 won per month answered that MSG is necessary to cook the foods.

Seasonal variations of consumption amount of MSG was as follows.

The largest quantity (35.4%) of MSG was consumed in winter and the least quantity of MSG was consumed in autumn (12.1%). These factors were not much fluctuated by age, educational level, and monthly income

Table 4. Seasonal fluctuation of MSG consumption

(unit : %)

Classification	No. of respondent	Spring	Summer	Autumn	Winter	Total
Total ;	(984)	24.9	27.6	12.1	35.4	100.0
A. Age ;						
20 - 29	(148)	22.3	29.7	7.4	40.6	100.0
30 - 39	(317)	29.3	29.0	11.4	30.3	100.0
40 - 49	(321)	27.7	24.9	13.4	34.0	100.0
Over 50	(198)	15.2	28.3	14.6	41.9	100.0
B. Education ;						
Elementary education	(224)	21.9	34.3	14.3	29.5	100.0
Middle school	(303)	29.7	26.1	14.2	30.0	100.0
High school	(352)	25.0	25.0	9.7	40.3	100.0
Above college	(105)	17.1	26.7	9.5	46.7	100.0
C. Monthly income ; (₩ 10,000)						
Below 20	(209)	26.3	33.0	11.0	29.7	100.0
20 - 39	(427)	27.4	24.1	14.3	34.2	100.0
40 - 59	(243)	21.4	30.9	9.1	38.6	100.0
60 - 79	(63)	15.9	27.0	12.7	44.4	100.0
Above 80	(42)	26.2	19.0	11.9	42.9	100.0
D. Area ;						
Seoul	(398)	22.9	33.3	10.6	33.2	100.0
Pusan	(198)	19.2	16.7	12.1	52.0	100.0
Taegu	(193)	26.4	25.9	6.2	41.5	100.0
Kwangju	(195)	33.4	28.7	21.0	16.9	100.0

level with an exception of Kwang-ju area where the housewives consumed more MSG in autumn (21%) than in winter (16.9%) (Table 4).

From the question which asked the MSG's usage upon each type of food cooking, 54.2% of respondents answered they used the MSG for all kinds of food cooking, 44.8% of respondents answered they used it for specific food cooking, and only 1% of respondents answered they never used MSG.

The ratio of housewife who used the MSG for all kind of food cooking was getting lower

against the educational level and monthly income level. According to the geographical groups and age level groups, MSG usage factor was not much different among each groups. But in Pusan area, MSG usage rate for all kind of food cooking was little bit less than other areas.

2. Consumption and intake amount of MSG

Based on an average body weight of 49.5kg for those who were involved in the investigation, the daily average MSG consumption per

Table 5. Distribution chart of personal daily MSG intake level

Classification	No. of respondent	Intake (g)/day	(unit : %)							
			0 1.57	1.58 2.57	2.58 3.57	3.58 4.57	4.58 5.57	5.58 6.57	6.58 7.57	7.58 over
Total ;	1000	1568.62	62.8	21.5	8.7	3.9	1.5	0.8	0.3	0.5
A. Age ;										
20-29	(149)	299.25	50.4	24.8	14.8	4.0	2.0	0.7	1.3	2.0
30-39	(323)	556.20	54.8	26.9	9.6	5.3	1.9	1.2	0.0	0.3
40-49	(329)	430.34	75.1	13.7	6.1	3.6	0.3	0.6	0.3	0.3
Over 50	(199)	282.82	64.9	23.1	7.0	2.0	2.5	0.5	0.0	0.0
B. Education ;										
Elementary education	(229)	417.92	56.2	20.1	11.0	6.6	3.5	0.9	0.9	0.4
Middle school	(304)	490.09	60.8	23.4	9.5	3.6	1.0	1.0	0.0	0.7
High school	(360)	543.40	63.5	22.8	7.8	3.3	1.1	0.6	0.3	0.6
Above college	(107)	117.19	79.5	15.0	3.7	0.9	0.0	0.9	0.0	0.0
C. Monthly income ; (₩10,000)										
Below 20	(210)	449.64	49.0	24.8	12.4	4.8	3.8	1.9	1.4	1.9
20-39	(438)	690.07	60.7	22.4	10.7	3.7	1.4	0.9	0.0	0.2
40-59	(247)	303.41	73.3	18.6	5.3	2.4	0.4	0.0	0.0	0.0
60-79	(63)	85.34	66.7	23.8	1.6	7.9	0.0	0.0	0.0	0.0
Above 80	(42)	40.14	85.7	9.5	0.0	4.8	0.0	0.0	0.0	0.0
D. Area ;										
Seoul	(400)	573.72	64.9	21.8	7.8	4.0	1.0	0.5	0.0	0.0
Pusan	(200)	278.13	70.0	16.5	8.5	3.5	0.5	1.0	0.0	0.0
Taegu	(200)	379.41	52.5	28.0	9.5	3.0	3.5	1.0	1.0	1.5
Kwangju	(200)	337.33	61.5	19.5	10.0	5.0	1.5	1.0	0.5	1.0

person was 1.69g, which was divided into 0.93 g in direct consumption and 0.76g in indirect consumption. On the other hand, the average daily MSG intake per person was slightly lower than the average consumption with 1.57g including 0.85g in average direct intake and 0.72g in average indirect intake.

From the result, Korean's daily average MSG intake per person was only 20 percent of 7.57g which could be regarded as the daily intake permission for the body weight of 49.5kg person in terms of acceptable daily intake (ADI) of 0.153g/kg which was recommended by the World Health Organization (WHO) (9).

The frequency distribution of intake indicated that the households who took below daily average of 1.57g account for 62.8 percent and those who took 1.58g to 2.57g represented 21.5 percent, while 8.7 percent of the households consumed 2.58g to 3.57g (Table 5). The proportion of households used MSG over the daily intake permission by WHO was

only 0.6 percent.

By age group, the comparison of daily MSG intake per person showed that 2.0 percent of 20's consumed MSG over the daily intake permission, and 0.5 percent of the rest group also took the excessive amount of permission. By the monthly total income, only 1.9 percent of those who earn less took the excessive amount of permission.

3. Relations with independent variables

The consumption of MSG is partly correlated with the age, monthly total income and educational background of housewives.

Namely, the intake amount of MSG has reverse trend against the age, monthly total income and educational background. Particularly, the correlation between the monthly total income level and intake level is most conspicuous ($r = 0.24$) (Table 6).

By age, the comparison of the total daily MSG consumption per person showed higher figures for the twenties and the thirties than

Table 6. Coefficients of intake level correlated with independent variables ($r=0.24$)

Content	Intake	Intake level		
		Total	Direct	Indirect
Age		0.1670	0.1292	0.1292
Monthly total income		0.2375	0.2006	0.1609
Educational background		0.1475	0.1260	0.0982

Table 7. Distribution of MSG consumption level by age group (unit : g/day/person)

Age	No. of household	Consumption level		
		Direct	Indirect	Total
20-29	149	1.26	0.91	2.17
30-39	323	1.02	0.84	1.86
40-49	329	0.73	0.67	1.40
Above 50	199	0.87	0.6	1.52

for the forties. Particularly age 20's group who regarded as the highest consumption group spent more than 1.55 times than the age 40's group.

On the contrary, the ratio of the direct consumption to the total consumption was higher in the age 20's group and age 50's group (Table 7). The lower the educational background group consumed more quantity of MSG. In the case of below elementary education level, whose MSG consumption is the highest, consumed more than 1.63 times of MSG than over college graduates. The ratio of the direct intake to the total intake was increased slightly against the educational level (Table 8).

As the monthly total income became lower,

the MSG consumption was getting higher. In the case of those who spent less than 200,000 won per month, the trend was more remarkable. The ratio of the direct consumption to the total consumption was the highest in below ₩200,000 won income level group. It was almost similar in the rest of cases (Table 9).

The average daily consumption of MSG per person was the highest in Taegu and the lowest in Pusan. The ratio of the direct consumption to the total consumption was 35 percent on an average in Seoul, Pusan and Taegu, whereas it was conspicuously higher in Kwangju with 62 percent.

The comparison of MSG intake by age showed that it was generally higher as the age became

Table 8. Distribution of MSG consumption by educational background

(unit : g/day/person)

Education	No. of household	Consumption level		
		Direct	Indirect	Total
Elementary education	229	1.11	0.84	1.95
Middle school graduate	304	0.95	0.79	1.74
High school graduate	360	0.89	0.73	1.63
Above college graduate	107	0.63	0.57	1.20

Table 9. Distribution of MSG consumption by monthly total income

(unit : g/day/person)

Income (₩/month)	No. of household	Consumption level		
		Direct	Indirect	Total
Below 200,000	210	1.36	0.97	2.32
200,000 - 300,000	438	0.93	0.76	1.69
400,000 - 590,000	247	0.68	0.64	1.32
600,000 - 790,000	63	0.75	0.66	1.41
Above 800,000	42	0.55	0.47	1.03

lower. Particularly, in the case of the housewives in 20's whose MSG intake was the highest, they consumed more than 1.5 times of MSG than 40's. However the proportions of both the direct intake and the indirect intake showed an almost similar trend.

By educational background, the lower it is, the higher MSG intake becomes. In particular, the average MSG intake by the college graduate group was remarkably lower than other groups. Also, in the lower educational background, the direct intake proportion in the total intake was generally higher than the indirect intake.

As the monthly total income increased, the average MSG intake was decreased. The housewives whose monthly total income is less than 200,000 won with the highest intake rate took more than 2.4 times of MSG than those who those spend more than 800,000 won per month.

The comparison data on MSG intake level by region showed increasing trend in order of Taegu, Kwangju, Seoul and Pusan. In particular, the intake in Taegu and Kwangju differs significantly from that in Seoul and Pusan.

In the case of Kwangju, the direct intake's proportion to the total intake turned out to be relatively higher than the figures for housewives in the other regions.

IV. Discussion

An average MSG consumption in Korea varies by individuals, ranging from 0 to 1.57g per person at present. It exceeds under no circumstances 3g per day according to this study. The trends lead to the conclusion that the MSG consumption is kept below the average intake level.

The result of the study also shows that MSG is consumed in less quantity in Korea than in other Asian countries. In particular, it is far below the intake levels of respectively Japan and Taiwan. The daily consumption by an individual Korean, as turned out in this study, is not more than 1.69g.

It seems the Asian consumes more MSG than the Westerner judging from the fact that staple foods of the Asian are mainly composed of cereals which include low content of MSG whereas those of the Westerner are meat, bread and cheese which have high content of MSG to result in enhancement of the taste (10, 11, 12). Therefore, it is considered that no significant intake level of MSG are existed between the Asian and the Westerner though no formal comparison reports on them were made.

Also, it can be said that intake level of MSG by a Korean, 1.69g per person a day, is devoting

Table 10. Distribution of MSG consumption by region

(unit : g/day/person)

Region	No. of household	Consumption level		
		Direct	Indirect	Total
Seoul	400	0.83	0.72	1.55
Pusan	200	0.70	0.71	1.48
Taegu	200	1.12	0.94	2.06
Kwangju	200	1.11	0.69	1.80

Table 11. Distribution of MSG intake level by age

(unit : g/day/person)

Age	No. of household	Intake level		
		Direct	Indirect	Total
29 - 29	149	1.14	0.87	2.01
30 - 39	323	0.92	0.80	1.72
40 - 49	329	0.67	0.64	1.31
Above 50	199	0.80	0.62	1.42

Table 12. Distribution of MSG intake level by educational background

(unit : g/day/person)

Education	No. of household	Intake level		
		Direct	Indirect	Total
Elementary education	229	1.03	0.80	1.82
Middle school graduate	304	0.85	0.76	1.61
High school graduate	360	0.81	0.70	1.51
College graduate and above	107	0.57	0.53	1.10

Table 13. Distribution of MSG intake level by monthly total income

(unit : g/day/person)

Total income (₩/month)	No. of household	Intake level		
		Direct	Indirect	Total
Below 200,000	210	1.22	0.92	2.14
200,000 - 390,000	438	0.85	0.73	1.58
400,000 - 590,000	247	0.61	0.62	1.23
600,000 - 790,000	63	0.74	0.62	1.35
Above 800,000	42	0.51	0.45	0.96

Table 14. Distribution of MSG intake level by region

(unit : g/day/person)

Region	No. of household	Intake level		
		Direct	Indirect	Total
Seoul	400	0.74	0.70	1.43
Pusan	200	0.72	0.67	1.39
Taegu	200	1.01	0.89	1.90
Kwangju	200	1.03	0.66	1.69

to health improvement by letting them take the tasty foods, considering also the report of Eguchi et al (13) regarding reducing effect of salt intake level to 30% of the control by taking MSG.

V. Conclusions

1. This study clarified the intake level of MSG per day per person in Korea as 1.57g through investigating 1000 households in Seoul, Pusan, Taegu, Kwangju area by means of the three-stage proportional random sampling method.
2. The frequency distribution of intake level indicated that the households who took below daily average of 1.57g account for 62.8 percent and those who took 1.58g to 2.57g represented 21.5 percent, while 8.7 percent of the households consumed 2.58g to 3.57g.
3. By region, it turned out the intakes are higher in order of Taegu (2.06g), Kwangju (1.80g), Seoul (1.55g) and Pusan (1.48g). In terms of the relative proportion in total, there is no significant difference between each cities.

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