

A Study on Nutritive Values and Salt Contents of Commercially Prepared Take-Out Boxed-Lunch In Korea

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ABSTRACT

This research was conducted on the 10 take-out boxed-lunches commercially prepared in the department stores, chain stores, and the public railroad trains in Korea. Sampling was conducted from February 1990 to March 1990.

Nutritive values and sodium contents of the 10 boxed-lunch samples are summarized as follows :

1) The average weight(percentage) of the cooked rice and the side dishes were 304.6g(49.4) and 312.4(506%), respectively.

The weight of these samples were significantly heavier than that of Japanese style boxed-lunches.

2) The average number of the side dishes was 12. The average numbers of food items classified by the five food groups were 6.1 in protein food group, 0.3 in calcium food group, 6.0 in vitamin and mineral food group, 1.5 in carbohydrate food group, and 1.5 in oil and fat food group.

3) They contained on the average 840.7kcal of energy, 38.9g of protein, 22.7g of fat, 120.4g of carbohydrate, 300.8mg of calcium, 410.8mg of phosphours, 6.61mg of iron, 219.8 R.E. of vitamin A, 0.46mg of thiamin, 0.67mg of riboflavin, 10.5mg of niacin, 27.5mg of ascorbic acid. Thus, except vitamin A, the content of all the nutrients were higher than the value of 1/3 of the RDA for adults.

4) The high priced group(group 2) had more protein, calcium, iron and niacin contents than the cheaper group(group 1). Probably, it's because the group 2 had more animal foods than the group 1.

5) The average energy content per unit price(100 won) was 37.3kcal and the average protein content per unit price(100 won) was 1.64g. Koreana style boxed-lunches had higher energy and protein contents per unit price than Japanese style, and the group 1 higher than the group 2.

6) The average energy proportions of protein, carbohydrate, and fat were 18.3%, 57.4%,

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and 24.3%, respectively. These proportions are good enough.

7) Frequency of cooking methods for the side dishes were found in the decreasing order : pan-frying, frying, braising, seasoning, kimchi, grilling, pickling, stir-frying, steaming and fermenting. Generally simple cooking methods were used, thus the menus were lack of varieties.

8) Frequency of colors for the side dishes were found in the decreasing order : red, brown, yellow, green, black, white. Too much red pepper was used.

9) The average capacity of the containers for the staples and the side dishes were 468.1ml and 590.6ml, respectively. And the containers could not keep the food items well seperated.

10) The average contents of sodium and salt were 2,287mg and 5.76g, in the range of 1,398mg to 3,489mg and 3.53g to 8.80g, respectively. These are much higher values than the recommended amount of salt.

KEY WORDS : Take-out boxed-lunch · nutritive value · salt content · eating out.

Introduction

With the Seoul Olympic Games in 1988 as a turning point, take-out boxed-lunch businesses have been increased. In accordance with this trend, people at home as well as in the office have been using commercially prepared boxed-lunches more frequently. However, most boxed-lunch manufacturing businesses in Korea are on relatively small scales.

Among the many domestic take-out boxed-lunches, "HokaHoka Bento of Japan" is the only foreign franchise.

This Japanese style boxed-lunch has had good reputations in such aspects as packing condition, beauty and hygiene¹⁾. But Korean people are not completely satisfied with it because it does not provide good tastes in accordance with their preferences.

In comparison with Japanese style boxed-lunch, Korean style take-out boxed-lunch usually contains bigger portions of food items, which often causes a problem of food waste.

Thus, the main purpose of this research is two-fold : (1) to measure and evaluate the nutritive

values and salt contents in the take-out boxed-lunches commercially available in Korea, and (2) to provide the data for nutritional improvement of the take-out boxed-lunches.

Method

1. Sampling

Boxed-lunch samples were collected from the department stores and franchise grocery stores in Seoul area, and boxed-lunch samples sold in the railroad dining facilities were also obtained from Samaul and Mogoongwha trains. Producers of 10 samples were Arirang(AR), Sammirak(SM), Samdado(SD), ABC(AB), Thecri(DK), Millim(ML), Mirakmi(MR), Jinmirak(JM), Sunhyang(SH), and Railroad Plaza(PL).

Two different price ranges were used : one was 1,500 to 2,000 won, and the other was 3,000 to 3,500 won(Tabel 1).

Samples were collected from February to March 1990.

2. Analytical and Statistical Methods

Nutritive values and nutritional composition

Korean take-out boxed-lunches

Table 1. Producers, purchase locations, weights, and prices of samples of take-out boxed-lunch

| Producer | Purchase location | weight | price |
|----------|------------------------------|--------|-------|
| | | g | won |
| AR | Lotte | 548 | 3,500 |
| SM | Yoido(store) | 873 | 3,000 |
| SD | Hyundai Dep't Store | 666 | 3,000 |
| AB | Jamsil Hanyang Store | 924 | 3,100 |
| PL | Saemaul Train Restaurant | 515 | 3,000 |
| SH | Mugunghwa Train Restaurant | 595 | 2,000 |
| DK | Myungdong Underground Arcade | 409 | 1,500 |
| ML | Yoido Dep't Store | 688 | 1,700 |
| MR | Kyunghee University | 558 | 1,700 |
| JM | Shincheon Campus | 595 | 1,700 |

of food groups of boxed-lunches were calculated from the food composition table²⁾, and cooking methods were also evaluated. Sodium contents in the homogenized and dehydrated food samples were analyzed by Atomic Absorption Spectrometry³⁾ by using Perkin-Elmer 2280 Spectrometer. All the statistical analyses were performed by using the SPSS-x⁴⁾.

Results and Investigation

1. Nutritional Evaluation

1) Composition between the Staples(cooked rice) and Side dishes.

The average weight of the cooked rice was 304.g (49.4%), and that of the side dishes was 312.3g(50.6%), leading the average weight of the whole samples to 631.45g. In comparison with that of Japanese style boxed-lunch, which was 547.2g¹⁾ and, as Mo¹⁾ reported, satisfied 62.3% of the respondents, the weight of the samples was turned out to be significantly heavier than that of Japanese style ($P < 0.05$). Thus, it can be pointed out that these samples possibly lead to a waste of food.

2) Nutritional Balance of food Items classified by Food Groups

The average number of the side dishes was 12.

The higher priced samples had more side dishes than the cheaper ones.

Table 3 shows the distribution of food items by food groups.

The first food group(protein food : meat, fish, bean)was equally found from all of the samples. The average number of the protein food group used was 6.1, with a wide range of 2 to 10.

The second food group (calcium food : milk, dairy products, small fish items that can be eaten as whole) was found only in 3 samples and, moreover, they contained only prepared dried anchovy. This food group was least used among the five food groups. This result was consistent with the results from other studies¹⁾⁵⁾⁶⁾.

The third food group(vitamin and mineral food : vegetables and fruits)was variously included in all of the samples. On the average, there were 6 food items. But, even though there were many kinds of food items of this group, most of them were fried or pan-fried. This did not satisfy the consumer's request of the fresh vegetables. Park⁵⁾reported that 10.7% of the respondents wanted more fresh vegetables.

The fourth food group (carbohydrate food : grains, potato)was also found in all of the samples because staples are grains. But the samples con-

Table 2. Weight and ratio between the cooked rice and side dishes in the samples of take-out boxed-lunches

| Producer | WeightsCooked | Side | Cooked | Side |
|----------|---------------|--------|--------|--------|
| | rice | Dishes | rice | Dishes |
| | g | g | % | % |
| AR | 240 | 308 | 43.8 | 56.2 |
| SM* | 300 | 427 | 41.3 | 58.7 |
| SD | 335 | 331 | 50.3 | 49.7 |
| AB | 409 | 515 | 44.3 | 55.7 |
| PL | 260 | 255 | 50.5 | 49.5 |
| SH | 270 | 325 | 45.4 | 54.6 |
| DK | 240 | 169 | 58.7 | 41.3 |
| ML | 349 | 339 | 50.7 | 49.3 |
| MR | 347 | 211 | 62.2 | 37.8 |
| JM | 296 | 243 | 54.9 | 45.1 |
| Mean | 304.6 | 312.3 | 49.4 | 50.6 |

*It contains soup. But in this table the weight of the soup was not added.

Table 3. The number of side-dishes and food items

| Producer | No. of Side-dish | No. of food items | | | | |
|----------|------------------|-------------------|-------|-------|-------|-------|
| | | Group | Group | Group | Group | Group |
| | | 1 | 2 | 3 | 4 | 5 |
| AR | 13 | 7 | 1 | 8 | 1 | 1 |
| SM | 16 | 7 | — | 8 | 2 | 3 |
| SD | 12 | 7 | — | 7 | 2 | 1 |
| AB | 17 | 5 | — | 9 | 3 | 1 |
| PL | 10 | 10 | — | 3 | 1 | 1 |
| SH | 10 | 7 | 1 | 4 | 2 | 2 |
| DK | 11 | 6 | — | 5 | 1 | — |
| ML | 11 | 2 | 1 | 8 | 1 | 1 |
| MR | 9 | 5 | — | 4 | 1 | 1 |
| JM | 13 | 8 | — | 5 | 1 | 3 |
| Mean | 12.2 | 6.1 | 0.3 | 6.0 | 1.5 | 1.5 |

tained only a few food items of this food group, lacking the variety of food items.

The fifth food group(fat food : oil and fat)was used during food preparation, frying, pan-frying, etc.

3) Nutritive Values of the Samples of Boxed-lunches

Table 4 and figure 1 show the nutritive values

found in 10 samples of boxed-lunches.

(1) Energy : The average energy content was 840.7kcal, with a range of 552.3kcal to 1277.6kcal. Five samples had lower values than 833kcal, which is 1/3 of the RDA for male adults, while two samples(PL, DK) had lower values than 667 kcal, 1/3 of the RDA for female adults.

(2) Protein : The average protein content was 38.9g, with a range of 20.3g to 68.6g. only one

Korean take-out boxed-lunches

Table 4. Nutritive values by calculation from food composition table

| Producer | Calorie | Protein | fat | Carbohyd -rate | Ca | P | Fe | VitaminA | Thiamin | Riboflav -in | Niacin | Ascorbic acid |
|-------------------------------------|---------|---------|------|-------------------|-------|-------|-------|----------|---------|-----------------|--------|------------------|
| | kcal | g | g | g | g | mg | mg | R.E. | mg | mg | mg | mg |
| AR | 728.8 | 46.8 | 22.0 | 85.7 | 308.3 | 569.4 | 6.26 | 363.1 | 0.30 | 0.54 | 9.9 | 30.1 |
| SM | 959.8 | 40.9 | 29.6 | 133.4 | 583.5 | 499.3 | 13.14 | 349.5 | 0.57 | 0.99 | 11.4 | 70.5 |
| D | 987.6 | 48.8 | 19.7 | 154.8 | 600.9 | 493.5 | 11.84 | 195.0 | 0.52 | 0.83 | 15.5 | 32.7 |
| AB | 1277.6 | 68.6 | 35.4 | 169.8 | 531.8 | 687.3 | 9.71 | 441.3 | 0.59 | 1.10 | 22.3 | 39.8 |
| PL | 617.4 | 31.0 | 14.1 | 90.9 | 100.0 | 279.9 | 4.19 | 145.9 | 0.37 | 0.73 | 10.1 | 15.6 |
| SH | 879.9 | 39.3 | 33.0 | 105.7 | 256.5 | 556.5 | 2.65 | 92.1 | 0.35 | 0.42 | 11.0 | 19.8 |
| DK | 552.3 | 20.3 | 15.5 | 83.2 | 154.2 | 132.2 | 3.39 | 92.1 | 0.27 | 0.19 | 3.2 | 6.9 |
| ML | 904.2 | 35.6 | 15.0 | 157.0 | 188.4 | 325.5 | 7.04 | 375.8 | 0.71 | 1.19 | 7.9 | 33.2 |
| MR | 737.9 | 30.4 | 17.5 | 114.7 | 87.4 | 281.1 | 3.95 | 112.4 | 0.47 | 0.34 | 7.1 | 16.3 |
| JM | 761.7 | 26.9 | 24.8 | 108.7 | 196.9 | 282.8 | 3.94 | 30.9 | 0.40 | 0.38 | 5.9 | 10.1 |
| MEAN | 840.7 | 38.9 | 22.7 | 120.4 | 300.8 | 410.8 | 6.61 | 219.8 | 0.46 | 0.67 | 10.5 | 27.5 |
| 1/3 of the RDA for male adults | 833.3 | 23.3 | — | — | 200.0 | — | 3.33 | 233.3 | 0.42 | 0.50 | 5.5 | 18.3 |
| 1/3 of the RDA for female adults | 666.7 | 20.0 | — | — | 200.0 | — | 6.00 | 233.3 | 0.33 | 0.40 | 4.3 | 18.3 |

sample(DK) had a lower value than 23.3g, 1/3 of the RDA for male adults and all the samples contained more than 20g, 1/3 of the RDA for female adults. Especially, the protein content of the high priced samples was two or three times the value of 1/3 of the RDA for adults. It may be a waste of food.

(3) Calcium and Iron : The average calcium content was 300.8mg, with a range of 87.4mg to 600.9mg. Five samples(PL, DK, ML, MR, JM) contained lower than 200mg of calcium, 1/3 of the RDA for adults.

On the other hands, the average iron content was 6.61mg, with a range of 2.65mg to 13.14mg. One sample(SH) had a lower value than 3.33mg, 1/3 of the RDA for male adults, while five samples (PL, DK, ML, MR, JM) contained lower than 6.0mg of iron, 1/3 of the RDA for female adults.

In both cases of calcium and iron, all the samples which had lower values than 1/3 of the RDA were cheaper than 2,000 won, except PL.

(4) Vitamins : The average vitamin A content

was 219.8 R.E. Six samples had lower values than 233.3 R.E., 1/3 of the RDA for both male and female adults.

The average thiamin content was 0.46mg. Only two samples (AR, DK) contained lower than 0.33 mg of thiamin, 1/3 of the RDA for female adults, while five samples(AR, PL, SH, DK, JM) contained lower than 0.42mg of thiamin, 1/3 of the RDA for male adults. The average riboflavin content was 0.67mg, with a range of 0.19mg to 1.19mg

The average niacin content was 10.5mg, with a range of 3.23mg to 22.3mg. The average ascorbic acid content was 27.5mg with a range of 7.9mg to 70.5mg.

These nutritive values are summarized in Fig. 1. All the nutrients except vitamin A had higher values than 1/3 of the RDA for male and female adults. A waste of food should be considered.

4) Comparison of Nutritive values according to the Prices

We classified the samples into two different groups based on their prices : the group 1 consists

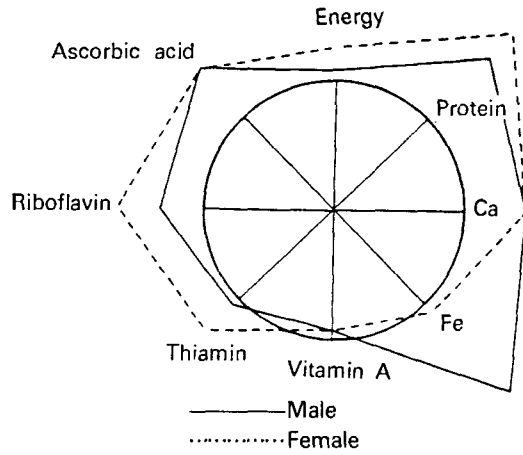


Fig. 1. Percentage of nutrients in the samples of take-out boxed-lunches to 1/3 of the RDA for adults.

of boxed-lunches with a price range of 1,500 won to 2,000 won, while the group 2 consists of boxed-lunches with a price range of 3,000 won to 3,500 won.

Table 5 shows the comparison of the nutritive values between two groups.

Boxed-lunches in the group 2 had an average weight of 674.9g, while those in the group 1 had an average weight of 553.7g. The former was heavier and had more side dishes than the latter. And, the higher priced samples had higher contents of protein, calcium, iron, and niacin than the cheaper ones. This was statistically significant at the level of $P < 0.05$.

The higher priced samples contained more animal foods, meat, fish, shellfish and egg. This result was consistent with the findings of kye and Yum⁶⁾. The average weight of total animal foods in boxed-lunches of the group 1 was 95.3g, 39% of the side dishes, while those in the samples of the group 2 was 154.6g, 44%

This result would be closely linked to the fact that the boxed-lunches in the group 2 contained significantly more protein, calcium, iron, and niacin than those in the group 1. But we should also

Table 5. Comparison of the nutritive values between two take-out boxed-lunch groups by price

| Nutrient | group ⁽¹⁾ | Mean ± S.D. |
|--------------------|----------------------|------------------------------|
| Calorie ,kcal | 1 | 767.2 ± 140.4 |
| | 2 | 914.2 ± 255.9 |
| Protein ,g | 1 | 30.50 ± 7.42 |
| | 2 | 47.22 ± 13.80 ⁽²⁾ |
| Fat ,g | 1 | 21.2 ± 7.7 |
| | 2 | 24.2 ± 8.4 |
| Carbohydrate ,g | 1 | 113.9 ± 26.9 |
| | 2 | 126.9 ± 37.6 |
| Calcium ,mg | 1 | 176.7 ± 62.0 |
| | 2 | 424.9 ± 216.0* |
| Iron ,mg | 1 | 4.19 ± 1.68 |
| | 2 | 9.03 ± 3.75* |
| Vitamin A ,R.E | 1 | 140.7 ± 135.0 |
| | 2 | 299.0 ± 123.7 |
| Thiamin ,mg | 1 | 0.44 ± 0.17 |
| | 2 | 0.47 ± 0.13 |
| Riboflavin ,mg | 1 | 0.50 ± 0.39 |
| | 2 | 0.84 ± 0.22 |
| Niacin ,mg | 1 | 7.01 ± 2.84 |
| | 2 | 13.84 ± 5.24* |
| Vitamin C ,mg | 1 | 17.26 ± 10.25 |
| | 2 | 37.74 ± 20.32 |

(1) Group 1; 1,500-2,000 Won

Group 2; 3,000-3,500 Won

(2) Means are significantly different at $P < 0.05$ by student t-test.

consider the fact that some calcium and iron in the group 2 come from vegetables which are difficult to be absorbed in human body.

5) Energy and Protein Contents per Unit Price (100 won)

The average energy per unit price (100 won) was 37.3 kcal. ML had the largest energy content of 53.3 kcal. JM the second, 45.0 kcal and SH the third, 44.0 kcal per unit price. PL had the lowest energy content of 20.5 kcal (Fig. 3).

The group 1, with the price range of 1,500 to 2,000 won, had energy content of 44.4 kcal, and

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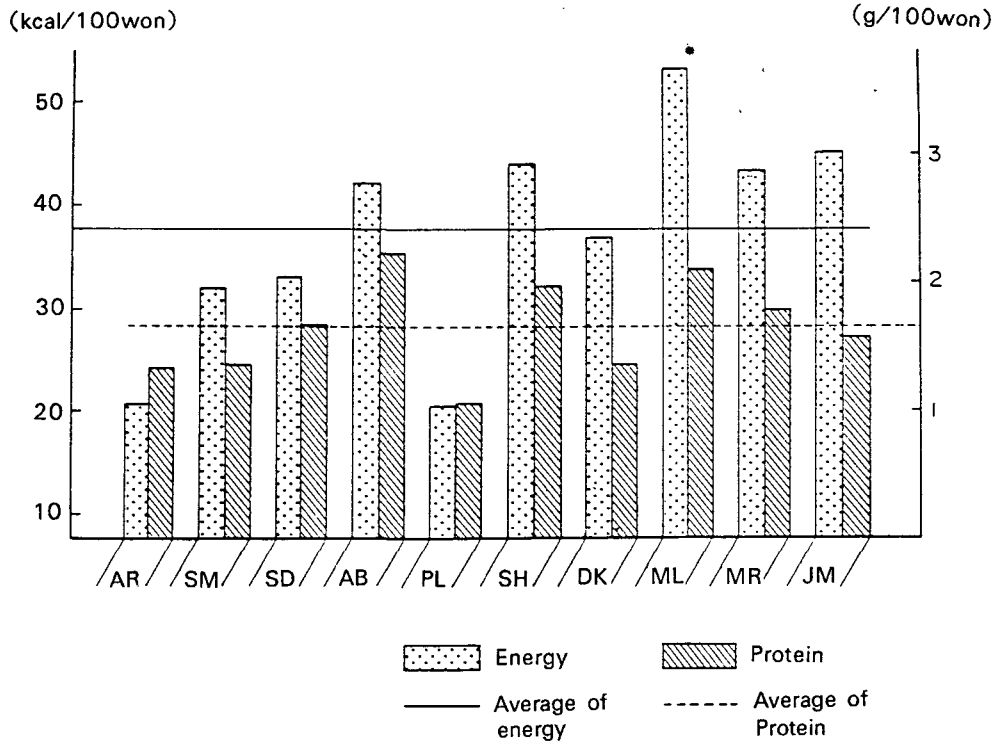


Fig. 2. Energy and protein per unit price(100 won).

group 2, with the price range of 3,000 to 3,500 won, had 295 kcal per unit price. Although this difference was not statistically significant, it implies that the group 2 was priced higher than it should be. Japanese style boxed-lunches had the average energy content of 30.6 kcal per unit price¹⁾ which was lower than that of the group 1, and is similar to that of the group 2.

Protein per unit price(100 won) was on the average 1.64g. AB had the highest protein content of 2.21g and ML the second, 2.10g and SH the third, 1.97g and PL had the smallest protein content of 1.03g(Fig. 2).

The protein content per unit price was also higher in the group 1(1.76g) than in the group 2(1.52g). Japanese style boxed-lunch had the average protein content of 1.18g per unit price¹⁾.

Thus, it should be pointed out that Japanese

style boxed-lunch is relatively overcharged compared with Korean style, and the group 2 is overcharged compared with the group 1.

6) Proportions of Protein, Carbohydrate, and Fat of Total Energy

The average percentages of protein, carbohydrate, and fat were 18.3%, 57.4%, and 24.3%, respectively, of the total energy(Fig. 3). Since the desired proportions of protein, carbohydrate and fat are 15%, 65%, and 20%, respectively, the proportions of the samples were as good as the desired

3. Composition of the Side dishes and Quality of the Containers

Tabel 6 shows the composition of the side dishes and figure 4 shows the cooking methods of the side dishes.

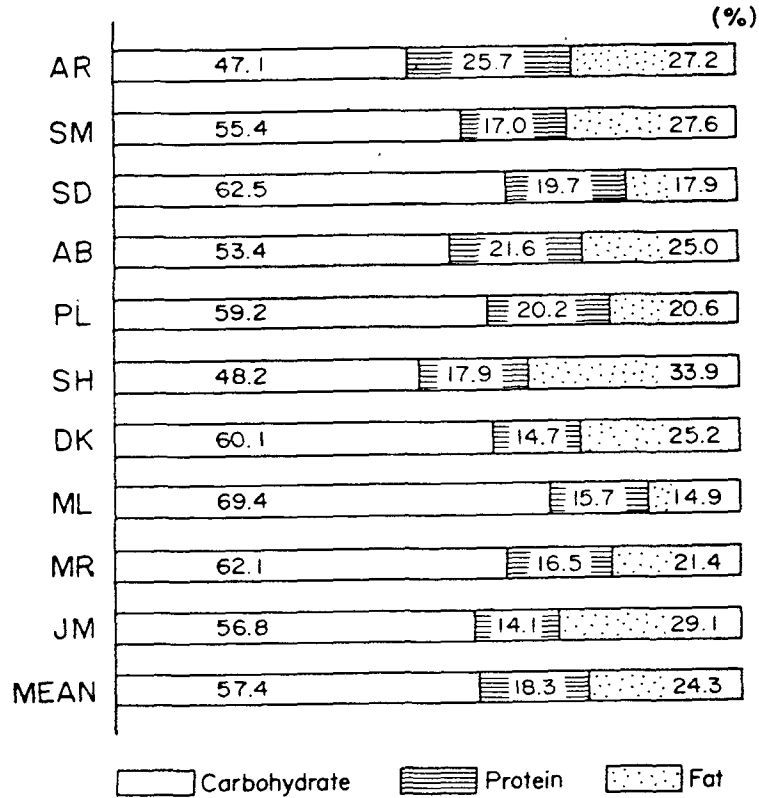


Fig. 3. Proportions of protein, carbohydrate, and fat of total energy.

Dry cooking methods were used most frequently for the side dishes in the boxed-lunches. Pan-frying, frying, braising, and seasoning are the most common cooking methods. And Kimch, grilled, salted, stir-fried, steamed, and fermented foods followed in the decreasing order of frequency.

Because most boxed-lunch manufacturing businesses are on relatively small scale⁸⁾⁹⁾, it seems that they usually use simple cooking methods. Thus, in spite of the large number of side dishes, they had the menus lacking variety. Park⁵⁾ also reported that 54.6% of respondents wanted the variety of the menus of boxed-lunches.

Table 7 shows the quality and capacity of the containers.

Plastic and styrofoam were the main materials

for the containers. More research is needed for the safety of these materials.

Containers for cooked rice had the average capacity of 462.4ml, with a range of 326.9ml to 636.5 ml. On the other hand, containers for side dishes had the average capacity of 609.1ml, with the wide range of 404.5ml to 941.2ml. Even though the capacity of the containers was appropriate, it failed to keep the each food items separated. Thus, the food items in the boxed-lunches were mixed together. Although high priced samples were somewhat better than the low priced samples, they also could not solve this problem basically. Park⁵⁾ also reported that 34.9% of the respondents wanted the boxed-lunches with the food items which were kept well separated.

Korean take-out boxed-lunches

Table 6. The composition of side dishes in the samples of take-out boxed-lunch.

| Producer | Composition of Side Dishes |
|----------|--|
| AR | pan-fried egg, grilled fish, imitation crab, pan-fried pepper & meats, pan-fried squash slices, pan-fried fish, fried fish, Nurumzeock, braised lotus root, seasoned cucumber, stir-fried green pepper & dried anchovy, dried squid, cabbage kimchi |
| SM | sausage, ham boiled egg & beef in soysauce, pan-fried egg, imitation crab, laver, sliced onion pickled in vinegar, fried fish, fried vegetables, seasoned spinach, stir-fried seaweed, pickled cucumber, kimchi, tangerine |
| SD | pan-fried egg, him, imitation carb, fried vegetable, boiled beef in soysauce, seasoned green laver, pollak, laver, cabbage kimchi |
| AB | pan-fried egg, boiled beef in soysauce, imitation crab, sausage, vienna sausage, pan-fried sliced squash, pan-fried mushroom, pan-fried green pepper & meat, pan-fried meatball, pan-fried fish, vinegared garlic, fried vegetable, dried pollak, dried radish slices, seasoned spinach, Danmuji, cabbage kimchi |
| PL | steamed egg, stewed chicken, fried mackerel, boiled fish paste, frank sausage, crab flesh, cabbage kimchi, laver, tangerine. |
| SH | rolled sausage & egg, fried sweet potato, fried chicken, boiled egg & beef in soysauce, braised dried anchovy, Danmuji, braised lotus root, radish kimchi, apple |
| DK | pan-fried egg, pan-fried meatball, boiled quail egg, pan-fried soybean curd, braised beans in soysauce, braised lotus roots, braised burdock, fishcake, lettuce, seasoned crown daisy, cabbage kimchi |
| ML | fried egg, fried squid dried filefish, sea tangle, pickled garlic stalk, stir-fried carrot slice, seasoned laver, naratzuke, cucumber kimchi, cabbage kimchi, laver |
| MR | fried chicken, pan-fried chicken, pan-fried meatball, ham, fermented squid, laver, pickled garlic stalk, seasoned dropwort, cabbage kimchi |
| JM | pan-fried egg, pan-fried sausage, imitation crab, fried meatball, pan-fried boiled fish paste, him, fried pollak, fried meat-bum, cucumber and broad bellflower, naratzuke, Danmuji, vinegared garlic, braised burdock |

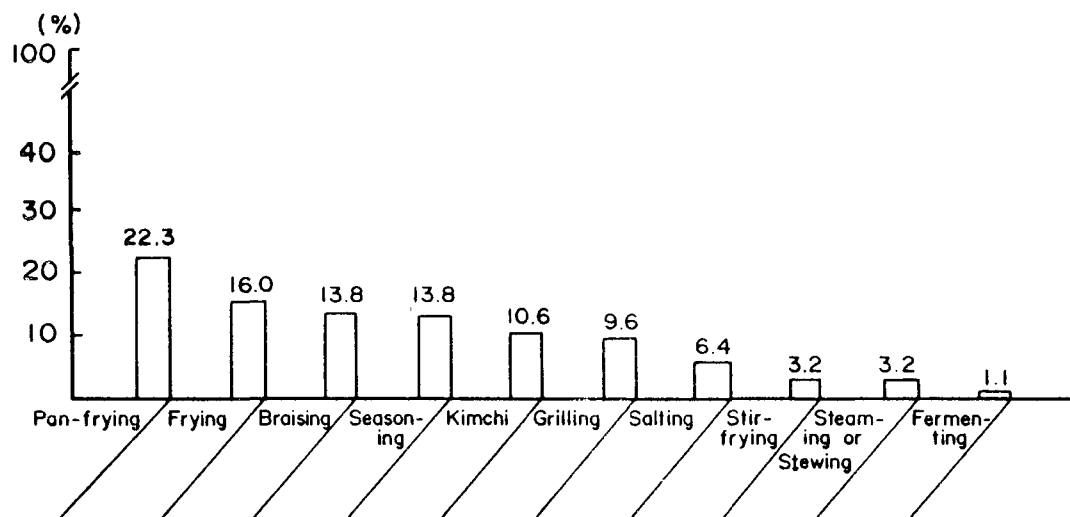


Fig. 4. Frequency of cooking methods for side dishes.

Table 7. Material and capacity of containers used for samples of take-out boxed-lunches

| Producer | Container for cooked vice | | Container for side-dish | |
|----------|------------------------------|----------|----------------------------|----------|
| | Material | Material | Capacity | Capacity |
| | | | cc | cc |
| AR | Plastic | 459.8 | plastic | 775.2 |
| SM | Styrofoam | 391.9 | plastic | 922.5 |
| SD | Styrofoam | 453.4 | plastic | 941.2 |
| AB | Styrofoam | 527.8 | plastic | 630.8 |
| PL | Plastic | 467.9 | plastic | 576.3 |
| SH | Plastic | 373.3 | plastic | 447.8 |
| DK | Plastic | 326.9 | plastic | 445.2 |
| ML | Styrofoam | 507.6 | Styrofoam | 507.6 |
| MR | Styrofoam | 636.5 | Styrofoam | 404.5 |
| JM | Styrofoam | 478.8 | Styrofoam | 439.8 |
| Mean | | 462.4 | | 609.1 |

Table 8. The color composition of side-dishes in take-out boxed-lunch

| Producer | Red | Yellow | Green | White | Brown | Black |
|----------|-----|--------|-------|-------|-------|-------|
| AR | 5 | 4 | 2 | — | 3 | — |
| SM | 6 | 2 | 1 | 1 | 3 | 2 |
| SD | 5 | 2 | 2 | — | 2 | 1 |
| AB | 7 | 6 | 3 | 1 | 2 | — |
| PL | 4 | 1 | — | 1 | 3 | 1 |
| SH | 3 | 3 | — | 1 | 5 | — |
| DK | 1 | 1 | 2 | 2 | 3 | 2 |
| ML | 6 | 2 | 1 | 1 | + | 3 |
| MR | 4 | 1 | 1 | — | 2 | 1 |
| JM | 5 | 2 | — | 1 | 5 | — |
| Mean | 4.6 | 2.4 | 1.2 | 0.8 | 2.7 | 0.9 |

Table 8 shows the composition of colors in the side dishes.

Colors of side dishes were red, yellow, green, white, brown and black. Red color was shown on the average in 4.6 side dishes, brown color was in 0.9, and white color was in 0.8 side dishes. The reason why red color was most frequently used in the side dishes could be explained by the fact that powdered red pepper had been widely used in cooking many Korean foods.

4. Sodium and Salt Contents in the Samples of Boxed-lunches

Sodium and salt contents in both cooked rice and the side dishes showed the wide range of 1,398.2mg to 3488.8mg and 3.53g to 8.80g. AB had the largest salt content of 8.80g SM was the second, 8.70g, ML was the third, 7.30g, and JM was the fourth, 6.91g. Since the recommended amount of salt is 6.4g a day, only 2.1g is recommended per a meal. So, these samples contained too

Korean take-out boxed-lunches

Table 9. Sodium and salt contents in take-out boxed-lunch

| producer | Total | | | | Side dishes | | | |
|------------------|---------------------------|----------|-------------------------|---------------------|---------------------------|----------|-------------------------|---------------------|
| | Weight ¹⁾ g | Na mg | Ncal ²⁾ g | Ncal(g) /100g | Weight ¹⁾ g | Na mg | Ncal ²⁾ g | Ncal(g) /100g |
| AR | 548.0 | 1790.0 | 4.48 | 0.64 | 308.0 | 1637.9 | 3.10 | 1.01 |
| SM ³⁾ | 868.0 | 3471.3 | 8.75 | 1.01 | 427.0 | 3281.3 | 8.27 | 1.44 |
| SD | 665.5 | 1622.5 | 4.09 | 0.61 | 331.0 | 1410.6 | 3.56 | 1.08 |
| AB | 924.0 | 3488.8 | 8.80 | 0.95 | 515.0 | 3229.7 | 8.14 | 1.58 |
| PL | 515.0 | 1782.0 | 4.49 | 0.87 | 255.0 | 1617.3 | 4.08 | 1.60 |
| SH | 580.0 | 1398.2 | 3.53 | 0.61 | 325.0 | 1227.2 | 3.09 | 0.95 |
| DK | 409.0 | 1949.8 | 4.92 | 1.20 | 169.0 | 1797.7 | 4.53 | 2.68 |
| ML | 688.0 | 2917.6 | 7.36 | 1.07 | 339.0 | 2696.5 | 6.80 | 2.01 |
| MR | 552.5 | 1704.8 | 4.29 | 0.78 | 211.0 | 1484.9 | 3.74 | 1.77 |
| JM | 539.0 | 2742.1 | 6.91 | 1.28 | 243.0 | 2554.9 | 6.44 | 2.65 |
| MEAN | 631.5 | 2286.71 | 5.76 | 0.90* ⁴⁾ | 312.3 | 2093.8 | 5.18 | 1.68* ⁴⁾ |

1) The weight of edible portion

2) These were calculated from sodium content, on the assumption that the whole sodium is contained in the form of salt.

3) Contained with soup 146g

4) Significantly different to Japanese style take-out boxed-lunches at $P < 0.05$ by student t-test

much salt and we strongly believe that it may become an important issue from a viewpoint of national health. Salt contents per unit weight(100g) of foods were 1.28g in JM, 1.20g in DK and 1.07g in ML(Table 9).

Sodium and salt contents in side dishes were in the range of 1,227.2mg to 3,281.3mg and 3.09g to 8.27g. Salt content per unit weight(100g) of side dishes were 2.68g in DK, 2.65g in JM and 2.01g in ML(Table 9).

Japanese style boxed-lunches had more sodium content, and more sodium content per unit weight than the present samples¹⁾. Especially sodium per unit weight(100g) of each group showed statistically significant difference. Probably, it's because Japanese style take-out boxed-lunches may contain the large amount of MSG, etc.

This leads to the conclusion that take-out boxed-lunches need much sodium and salt for the storage⁹⁾¹⁰⁾ and this causes one of the major problems of eating out.

Conclusion

This research revealed that there were too many side dishes in the 10 samples of boxed-lunches. All the producers of the boxed-lunches use simple cooking methods, and try to increase the food quantities or the number of food items rather than developing their own distinctive menus.

Moreover, it was pointed out that many nutrients in samples exceeded 1/3 of the RDA for male and female adults. Thus, we should think over the waste of foods.

The containers also had a problem. When boxed-lunches are packaged, the food items should be separated not to be mixed together.

It was found that the average salt contents were too high for 1/3 of the desirable salt amounts of 6.4g for adults a day, even if it was lower than that of Japanese style boxed-lunches. And we should make efforts to reduce the salt content in

take-out boxed-lunches for our health.

Finally, we feel that it becomes necessary to standardize desirable menus in food composition and nutritive values of take-out boxed-lunches.

We hope that this research finding can become the reference informations in improving the quality of commercially available take-out boxed-lunches in Korea.

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한국형 시판 도시락의 영양가 및 식염함량

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=국문 초록=

시판 도시락의 이용도가 크게 증가함에 따라, 시판 중인 한국형 도시락의 영양가와 염분량을 조사하고자 백화점, 체인점, 열차 등에서 10가지 종류의 도시락을 구입하였다. 영양가는 식품분석표에 의하여 계산하였고 염분은 원자흡광법에 의하여 Na 함량을 분석한 후 환산하였다.

도시락은 두가지를 제외하고는 모두 밥과 반찬이 따로 포장되어 있었고, 그 무게는 각각 304.6g, 312.4g으로 무거운 편이었다. 반찬의 수는 평균 12가지였는데 그중 단백질 식품이 6가지로 가장 많았고, 칼슘 식품은 3도시락에만 있었고 그것도 멸치 볶음 한가지였다.

열량은 평균 840.7kcal로 남녀성인이 1끼 권장량보다 많았고, 단백질 38.9g, 지질 22.7g, 칼슘 300.8mg, 인 410.8mg, 철분 6.61mg, 비타민 A 219.8R.E., 티아민 0.46mg, 리보플라빈 0.67mg, 나이아신 10.5mg, 비타민 C 27.5mg으로 비타민 A만이 남녀성인 1끼 권장량에 약간

Korean take-out boxed-lunches

미달하였고, 다른 영양소들은 평균적으로 권장량이상 이었다. 또한 3000원 이상의 도시락은 2000원 이하의 도시락에 비해 동물성 식품이 많아서 단백질, 칼슘, 철, 나이아신이 유의적으로 더 많았다($P < 0.05$). 탄수화물, 단백질, 지질의 열량비율은 평균 57.4%, 18.3%, 24.3%로 양호하였다. 조리법은 전(22.3%)과 튀김(16.0%)이 가장 많았고 조림, 구이, 볶음 등 건식 조리법이 주로 이용되어 많은 반찬가짓수에 비해, 실제 식단은 단조로운 편이었다.

염분의 함량은 3.53g에서 8.80g으로, 평균 5.76g이나 되어, 한끼 필요량을 크게 초과하고 있었다.

앞으로 도시락의 염분함량을 줄이는 동시에 다양한 조리법과 식단으로 맛있고 보기 좋고 영양적으로 균형잡힌 도시락 식단을 개발하는 데 노력을 기울여야 하겠다.