Short Communication

Reproducibility and validity of semi-quantitative food frequency questionnaire measuring dietary trans-fatty acids intake among Korean adults

Hee-Kyung Joh1,2,3, Seung-Won Oh4 and Eun Lee5

1Department of Medicine, Seoul National University College of Medicine, Seoul, 110-799, Korea
2Department of Family Medicine, Konkuk University Medical Center, Seoul, 143-729, Korea
3Department of Family Medicine, Seoul National University Health Service Center, 1 Gwanak-ro, Gwanak-gu, Seoul, 151-742, Korea
4Department of Family Medicine, Healthcare System Gangnam Center, Seoul National University Hospital, Seoul, 135-984, Korea
5Department of Nutrition, Konkuk University Medical Center Healthcare Center, Seoul, 143-729, Korea

BACKGROUND/OBJECTIVES: Compelling evidence indicates that consumption of trans-fatty acids (TFA) is associated with a wide range of diseases. However, few validated tools for TFA intake assessment are available in Korea. We aimed to validate a food frequency questionnaire (FFQ) estimating usual intake of TFA in Korean adults.

MATERIALS/METHODS: Eighty-two healthy adults completed an FFQ with a 3-day diet record (3DDR), and 58 completed a second FFQ at a 1-month interval. To assess the reproducibility of the FFQ, we compared estimated TFA intakes from each FFQ. To assess the validity, we compared estimates from the FFQ with those from the 3DDR.

RESULTS: The FFQ was reproducible (Spearman r = 0.71) and provided modest correlations with the 3DDR (Spearman r = 0.38). After adjustment for total energy intake, the correlations increased (r = 0.45). Measurement-error correction also de-attenuated the correlations (r = 0.57). When quintiles of the FFQ and 3DDR were joint-classified, 9% on average were misclassified into extreme quintiles.

CONCLUSIONS: Our findings suggest that the developed FFQ is reproducible and reasonably valid in categorizing individuals according to TFA intakes among healthy young and middle aged adults in Korea.

Keywords: Trans-fatty acid

INTRODUCTION

Evidence from epidemiologic studies and randomized controlled trials indicates that trans-fatty acids (TFA) consumption is associated with a wide range of diseases, including coronary heart disease [1,2], dyslipidemia [3], obesity [4], diabetes [5], and cancer [6]. The World Health Organization recommended in 2003 that TFA intake be limited to less than 1% of total energy intake [7]. Several Western countries, including Denmark [8], Netherlands [9], US [10,11], and Canada [12], have taken action to regulate the consumption. Likewise, mandatory nutrition labeling of TFA in Korea came into effect in December 2007 [13].

Although overall intake of TFA in Korea is relatively low compared with that in Western countries [13], consumption of fast foods and confectionary, which usually contain the most TFA, is higher and has increased among children, adolescents, and young adults [14,15]. Thus, the adverse health effects of TFA will be more prominent in near future. However, few validated tools for TFA intake assessment are available in Korea. One reason has been the lack of comprehensive TFA database. Between 2004 and 2006, the Korean Food and Drug Administration (KFDA) constructed a TFA database on more than 500 foods and products [13]. Using this database, we developed a semi-quantitative food frequency questionnaire (FFQ) estimating TFA intake.

FFQ has been widely used in epidemiologic studies because of its low cost and feasibility. Such FFQ should be reproducible and valid. Reproducibility refers to consistency of measurements on repetition; validity refers to the ability to measure what the FFQ was designed to measure. To assess validity, a superior, although always imperfect, standard is used for comparison [16]. In this study, we assessed the reproducibility and validity of an FFQ by comparing estimates of TFA intake from the FFQ and a 3-day diet record (3DDR) among healthy adults.

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§ Corresponding Author: Hee-Kyung Joh, Tel. 82-2-880-5350, Fax. 82-2-880-9274, Email. hkjoh@snu.ac.kr
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SUBJECTS AND METHODS

Study population
We recruited volunteers among healthy medical students and nurses aged 20-55 years in a university hospital in Seoul, Korea. We excluded individuals who reported gaining or losing greater than 5 percent of their body weight in the previous year, those who reported major changes in their diets, and those who started to take new drugs regularly during the previous year. Participants were asked to complete an FFQ and a 3DDR, followed by a second FFQ after 1 month. Of the 100 initial participants, 18 subjects who did not complete the 3DDR or first FFQ (FFQ1) were also excluded. In current analyses, we included 82 participants (61 women, 21 men). Among them, 58 provided a second FFQ (FFQ2). The Institutional Review Board of Konkuk University approved this study (No.2008-25-52).

Development of the FFQ
In consultation with an experienced nutritionist and the Nutrition Assessment Team of the KFDA, we developed a 74-line item semi-quantitative FFQ requesting information on individuals’ usual diets during the last 6 months (see Appendix). We used the format of Kim’s FFQ [17], which were validated for general dietary assessment in Korea, and modified it to be most sensitive to TFA intake.

Our data source for dietary TFA was based on the KFDA report in 2006 (not open to the public) [13] which includes specific brand names for about 500 foods and products commonly consumed and considered to contain appreciable amounts of TFA. From those, we selected 118 major TFA sources (margarine, shortening, bread, cake, chocolate, confectionery, pop corn, french fries, doughnuts, dairy, and meats) that are ranked highly in TFA content and frequently consumed among Korean children and young adults. According to the similarity of TFA contents per portion size, the 118 items were grouped into 56-line items and then included in the FFQ. To estimate total calorie and other nutrient intakes, we asked additional 18-line items about commonly consumed foods in Korea. For other nutrients’ compositions, we used the Korean Nutrition Society Food and Nutrition Database [18].

For each food item listed, we specified a portion size using natural units whenever possible (e.g., a slice of bread) and otherwise using typical serving sizes (e.g., 1 teaspoon of margarine). Participants were asked about their usual frequency of consumption for each food by selecting one of nine possible responses ranging from ‘never or less than once per month’ to ‘more than 2 times per day’. To calculate a total TFA intake for each individual, we multiplied a weight assigned to the consumption frequency (e.g., once per day is equal to 1) by the TFA composition for the specified portion size of each food and then summed across all foods.

3-Day dietary record
Participants completed a 3DDR over a 1-week period. To better capture day-to-day variability, participants were asked to keep records for 2 days on weekdays and 1 day on the weekend. A dietitian provided detailed instructions to each participant on estimating portion size and recording all foods consumed, including brands, preparation methods, and recipes whenever possible. To aid in standard portion size estimation, specifically devised food models were used. After completion of the 3DDR, the dietitian reviewed all entries, interviewed each participant to resolve any ambiguities or incompleteness, and coded the records. TFA intakes from the 3DDR were analyzed using CAN-Pro (ver 3.0, The Korean Nutrition Society) [18], a nutrient software package, by entering the KFDA database on TFA into this program.

Statistical analysis
Nutrient estimates from the FFQ and 3DDR were natural log transformed since they were skewed toward higher values. Because nutrient intakes are correlated with energy intake, we adjusted for total energy intake with regression-residual method to remove the variation due to energy intake and its correlated measurement error [19].

The reproducibility of the FFQ was assessed by comparing FFQ1 and FFQ2 using the Spearman and Pearson correlation coefficients, and its validity was evaluated by comparing the FFQ and 3DDR using those correlations. Within-person variation in daily intakes may cause measurement error in the 3DDR, which can attenuate correlations between the FFQ and 3DDR. To de-attenuate these correlations, we calculated corrected correlation coefficients using the probit transformation [20] (for the Spearman correlation) and the within- to between-person variance ratios [21,22] (for the Pearson correlation). Regression coefficients were calculated by regressing TFA intakes from the 3DDR on the estimates from the FFQ.

Since nutritional measurements are usually utilized as categorical variables in epidemiologic studies, we categorized energy-adjusted TFA intakes into quintiles for the FFQ1 and 3DDR, and examined their joint classification. Statistical tests were performed using STATA version 12.0 (Stata Corp., College Station, TX) and SAS version 9.3 (SAS Institute Inc., Cary, NC).

RESULTS
Among 82 participants who provided both 3DDR and FFQ1, 58 individuals completed the FFQ2 (Table 1). Dietary intakes estimated using the FFQ1 were higher than those using the FFQ2 ($P \leq 0.02$). Compared to the 3DDR, TFA intake from the FFQ (average between FFQ1 and FFQ2) was higher ($P = 0.04$). The FFQ underestimated total calorie intake compared with the 3DDR ($P < 0.001$), but the mean absolute total fat intake was roughly comparable between the two methods ($P = 0.40$).

Reproducibility
The Spearman and Pearson correlations between the estimates from the FFQ1 and FFQ2 were identical and reasonably high ($r = 0.71$, $P < 0.001$), indicating a high degree of reproducibility (Table 2). Adjustment for total energy intake did not appreciably alter these correlations. The within- to between-person variance ratios of TFA intakes (energy-adjusted) from the 3DDR were 0.80.

Validity
The Spearman and Pearson correlations between the FFQ and
Table 1. Characteristics of study participants and mean (standard deviation) daily trans-fatty acids and calorie intakes estimated by a 3-day diet record (3DDR), and second pass of the trans-fat food frequency questionnaire (FFQ2)

| Age (yrs) | 3DDR (n = 82) | FFQ1 (n = 82) | FFQ2 (n = 58) | p1 | p2 |
|-----------|---------------|---------------|---------------|----|----|
| Male (%)  | 25.6 (25.6)   | 25.6 (25.6)   | 15.5 (15.5)   | -  | -  |
| Body mass index (kg/m^2) | 21.9 (2.8) | 21.9 (2.8) | 21.9 (2.6) | - | - |
| Total calorie (kcal) | 1709.6 (309.4) | 953.2 (528.9) | 773.7 (506.3) | 0.01 | < 0.001 |
| Total fat (g) | 49.3 (13.6) | 51.7 (29.8) | 42.0 (29.4) | 0.02 | 0.40 |

Table 2. Reproducibility of semi-quantitative food frequency questionnaire (FFQ) and intraclass correlation and variance components ratios (S^2/S_0) for the 3-day diet record (3DDR)

|          | FFQ1 vs. FFQ2 | 3DDR |
|----------|---------------|------|
| Spearman | Unadjusted: 0.71 | 0.71 |
|          | Energy adjusted: 0.66 | 0.67 |
| Energy adjusted | 0.54 | 0.55 |

Table 3. Correlation (r) and regression (b) coefficients between semi-quantitative food frequency questionnaires (FFQs) and the average of 3-day diet record (3DDR) calculated for unadjusted and energy-adjusted trans-fatty acids intake

Table 4. Comparison of trans-fatty acids intake from FFQ1 with the mean of 3-day diet record (3DDR) based on joint classification of quintiles calculated from energy-adjusted intake

DISCUSSION

In this study, we validated a 74-line item self-administered semi-quantitative FFQ estimating usual intake of TFA in Korean young adults. The FFQ was reproducible and provided reasonably valid in categorizing individuals according to TFA intakes among healthy young and middle aged Korean adults compared with the 3DDR.

In the validation of dietary assessment methods, it is desirable to compare methods with uncorrelated errors to reduce the possibility of artificially inflated correlations. In this study, we employed dietary records (DRs) as a reference because it allows direct measurement of food quantities and minimally depends on memory, whereas an FFQ relies primarily on individuals’ recall of their usual food intakes over a long-term period.
The correlation coefficients between the FFQ and 3DDR were modest. Because both the FFQ and 3DDR (the reference) are imperfect measures of long-term intake, the modest correlations might be due to errors in both methods. Hunter et al.[25] compared two 1-week diet records (DRs) and an FFQ with subcutaneous fat aspirates for polyunsaturated fatty acid intake measurement. Correlations comparing the two dietary assessment methods to the actual fat stores from aspirates were very similar. These results suggest that an FFQ and DRs have similar degrees of error, thus the conventional practice of using a DR as a gold standard may substantially underestimate the validity of an FFQ. To decrease this bias, we calculated measurement-error-corrected correlations, and the de-attenuated correlation coefficients were reasonably high.

In our results, TFA intake from the 3DDR correlated more strongly with the first FFQ (completed before the 3DDR collection) than the second FFQ (completed after). Plausible explanations are that the process of keeping a 3DDR may have sensitized participants to their TFA consumption, so that they may have changed their usual dietary patterns or under-reported, consciously or unconsciously, their consumption of TFA-containing foods that are socially less desirable. When a simple FFQ is compared with a more detailed assessment method in the same individual, the sequence of assessment is important because the completion of one method may affect the performance of and responses to the other method, especially in short intervals [24]. Furthermore, tendencies to under-report unhealthy foods and over-report socially desirable foods have been documented in previous studies [16].

This study has several limitations. First, a 3DDR cannot fully represent a long-term usual diet. This measurement error can decrease the correlations between the FFQ and 3DDR. To minimize this error, we provided de-attenuated correlations. Second, the FFQ and 3DDR were administered at short intervals, which might have influenced the correlations between these methods. Third, although estimation of calorie intake was not performed, consciously or unconsciously, their consumption of TFA-containing foods that are socially less desirable. When a simple FFQ is compared with a more detailed assessment method in the same individual, the sequence of assessment is important because the completion of one method may affect the performance of and responses to the other method, especially in short intervals [24]. Furthermore, tendencies to under-report unhealthy foods and over-report socially desirable foods have been documented in previous studies [16].

The strengths of this study include that, to our knowledge, this is the first validation study of an FFQ assessing TFA intake in Koreans. We used the KDFA database, which encompasses various foods and specific brands. The 3DDR was reviewed and coded by a dietitian to minimize variability in data interpretation.

In conclusion, the semi-quantitative FFQ developed in this study reasonably categorizes individuals by TFA intake. These findings suggest the potential applicability of this FFQ in a larger population to quantify relationships between TFA intake and various health outcomes. Recently, the levels of TFA in food products have been changing, thus it is warranted to update and refine the FFQ continuously.

REFERENCES

1. Willett WC, Stampfer MJ, Manson JE, Colditz GA, Speizer FE, Rosner BA, Sampson LA, Hennekens CH. Intake of trans fatty acids and risk of coronary heart disease among women. Lancet 1993;341:581-5.

2. Mozaffarian D, Katan MB, Ascherio A, Stampfer MJ, Willett WC. Trans fatty acids and cardiovascular disease. N Engl J Med 2006;354:1601-13.

3. Mensink RP, Zock PL, Kester AD, Katan MB. Effects of dietary fatty acids and carbohydrates on the ratio of serum total to HDL cholesterol and on serum lipids and apolipoproteins: a meta-analysis of 60 controlled trials. Am J Clin Nutr 2003;77:1146-55.

4. Thompson AK, Minihane AM, Williams CM. Trans fatty acids and weight gain. Int J Obes (Lond) 2011;35:315-24.

5. Hu FB, Manson JE, Stampfer MJ, Colditz G, Liu S, Solomon CG, Willett WC. Diet, lifestyle, and the risk of type 2 diabetes mellitus in women. N Engl J Med 2001;345:790-7.

6. Mozaffarian D, Aro A, Willett WC. Health effects of trans-fatty acids: experimental and observational evidence. Eur J Clin Nutr 2009;63 Suppl 2:55-21.

7. World Health Organization (CH), WHO Technical Report Series 916. Diet, Nutrition and the Prevention of Chronic Diseases. Report of a Joint WHO/FAO Expert Consultation. Geneva: World Health Organization; 2003.

8. Astrup A. The trans fatty acid story in Denmark. Atheroscler Suppl 2006;7:43-6.

9. Spaaij CJ, Pijls LT. New dietary reference intakes in the Netherlands for energy, proteins, fats and digestible carbohydrates. Eur J Clin Nutr 2004;58:191-4.

10. Moss J. Labeling of trans fatty acid content in food, regulations and limits-the FDA view. Atheroscler Suppl 2006;7:57-9.

11. Panel on Macronutrients; Panel on the Definition of Dietary Fiber; Subcommittee on Upper Reference Levels of Nutrients; Subcommittee on Interpretation and Uses of Dietary Reference Intakes; Standing Committee on the Scientific Evaluation of Dietary Reference Intakes; Food and Nutrition Board; Institute of Medicine of the National Academies. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington, D.C.: The National Academies Press; 2002.

12. Holick MF. Vitamin D for health and in chronic kidney disease. Semin Dial 2005;18:266-75.

13. Korea Food and Drug Administration. Risk Profile: Trans Fat. Seoul: Korea Food and Drug Administration; 2010.

14. Lee SE. A study on perception, knowledge and intake of trans fats of middle school students in Incheon [master's thesis]. Incheon: Inha University; 2008.

15. Ministry of Health and Welfare, Korea Centers for Disease Control and Prevention. Korea Health Statistics 2009: Korea National Health and Nutrition Examination Survey (KNHANES IV-3). Cheongwon: Korea Centers for Disease Control and Prevention. Korea Health Statistics 2009: Korea National Health and Nutrition Examination Survey (KNHANES IV-3). Cheongwon: Korea Centers for Disease Control and Prevention; 2010.

16. Salvini S, Hunter DJ, Sampson L, Stampfer MJ, Colditz GA, Rosner B, Willett WC. Food-based validation of a dietary questionnaire: the effects of week-to-week variation in food consumption. Int J Epidemiol 1989;18:858-67.

17. Kim WY, Yang EJ. A study on development and validation of food frequency questionnaire for Koreans. Korean J Nutr 1998;31:220-30.

18. The Korean Nutrition Society. CAN-Pro 3.0. Seoul: The Korean Nutrition Society; 2006.

19. Willett W, Stampfer MJ. Total energy intake: implications for epidemiologic analyses. Am J Epidemiol 1986;124:17-27.

20. Rosner B, Glynn RJ. Interval estimation for rank correlation coefficients based on the probit transformation with extension to measurement error correction of correlated ranked data. Stat Med 2007;26:633-46.
21. Beaton GH, Milner J, Corey P, McGuire V, Cousins M, Stewart E, de Ramos M, Hewitt D, Grambsch PV, Kassim N, Little JA. Sources of variance in 24-hour dietary recall data: implications for nutrition study design and interpretation. Am J Clin Nutr 1979;32:2546-59.
22. Rosner B, Willett WC. Interval estimates for correlation coefficients corrected for within-person variation: implications for study design and hypothesis testing. Am J Epidemiol 1988;127:377-86.
23. Willett W, Lenart E. Chapter 6. Reproducibility and validity of food-frequency questionnaires. In: Willett W, editor. Nutritional Epidemiology. 2nd ed. New York (NY): Oxford University Press; 1998. p.110-24.
24. Willett WC, Sampson L, Stampfer MJ, Rosner B, Bain C, Witschi J, Hennekens CH, Speizer FE. Reproducibility and validity of a semiquantitative food frequency questionnaire. Am J Epidemiol 1985;122:51-65.
25. Hunter DJ, Rimm EB, Sacks FM, Stampfer MJ, Colditz GA, Litin LB, Willett WC. Comparison of measures of fatty acid intake by subcutaneous fat aspirate, food frequency questionnaire, and diet records in a free-living population of US men. Am J Epidemiol 1992;135:418-27.
## Appendix. Trans-fatty Acids Food Frequency Questionnaire (English)

For each food listed, fill in the box indicating how often on average you have used the amount specified during the past 6 months.

### AVERAGE USE LAST 6 MONTHS

| RICE, BREADS, STARCHES, FAST FOODS | Never or < 1/month | 1 per month | 2-3 per month | 1-2 per week | 3-4 per week | 5-6 per week | 1 per day | 2 per day | 3 per day | Portion size | Less | Same | More |
|-----------------------------------|--------------------|-------------|---------------|-------------|--------------|--------------|-----------|----------|----------|-------------|------|------|------|
| Rice | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 bowl (210 g) | 1 | 1 | 1 |
| Bread, toast | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 2 slices (70 g) | 2 | 1 | 1 |
| Margarine, spread | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 2 ts (8 g) | 2 | 1 | 1 |
| Butter | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 ts (5 g) | 1 | 1 | 1 |
| Instant noodle | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 bowl (120 g) | 1 | 1 | 1 |
| Hamburger | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 1 | 1 | 1 |
| Pizza | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 2 slices | 2 | 1 | 1 |
| Spaghetti/pasta | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 bowl (250 g) | 1 | 1 | 1 |
| Cake, pastry, stick pie, croissant | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Cake: 1 slice others: 1 | 1 | 1 | 1 |

### BAKED GOODS, CONFECTIONERY

| French fries | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 serving | 1 | 1 | 1 |
| Cruller, red bean bun | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack | 1 | 1 | 1 |
| Ho-duck, Bam-manju | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 1 | 1 | 1 |
| Doughnut | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 1 | 1 | 1 |
| Muffin, pound cake | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1, 1 slice | 1 | 1 | 1 |
| Mini-ball (7-8), butter-roll (3), sponge cake (1) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 7-8, 3, 1 pack | 1 | 1 | 1 |
| Cream bun, pineapple bun | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack | 1 | 1 | 1 |
| Popcorn (for microwave) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack | 1 | 1 | 1 |
| Popcorn (conventional) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 serving | 1 | 1 | 1 |
| Corn-choco, Corn-cheese, Sado-bap, Sun-chip | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack (45 g) | 1 | 1 | 1 |
| Kokol-com, Cheetoz | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack | 1 | 1 | 1 |
| Chipeulls (1/2), O-gamja (1/2), Guen-gamja (1) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1/2 pack, 1 pack (35 g) | 1 | 1 | 1 |
| Pokan (1), Tinkle (1), Kameo (1/2) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack, 1/2 pack (50 g) | 1 | 1 | 1 |
| Zec (1), Butter-ring (1/2) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 small pack, 1/2 pack (45 g) | 1 | 1 | 1 |
| Wehas, Arte, Ace, Oh-yes, Mongshell-tongtong, Choco-pie | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack (30 g) | 1 | 1 | 1 |
| Kan-cho, Dangkong-sand, Hauete | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack | 1 | 1 | 1 |
| Fresh-bery (1), Castard (1), Potto (1), Kukudas (4) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack (23 g), 4 packs | 1 | 1 | 1 |
| Oh-new, Na | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack (20 g) | 1 | 1 | 1 |
| Juju-dongmulwon, Iyu, Harvest, Chocochip, Its, Digechoco | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack | 1 | 1 | 1 |
| Tongk, Nalsin-gamja | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack | 1 | 1 | 1 |
| Cham-cracker, French-pie, San-do, Choco-helmi | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack | 1 | 1 | 1 |
| Bintz (1), Bebe (1), Keyran-kaja (1), Sabre (4) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack, 4 pieces (Sabre) | 1 | 1 | 1 |
| Choco-songi, Ai-songi, Margaret, Wa-dilang, Lottie-sand | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack | 1 | 1 | 1 |
| Oh-chamkae, Meein-black | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 pack | 1 | 1 | 1 |
| Paeopaero, Kosorni, Yachae-cracker, Choco-fakey | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1/2 pack | 1 | 1 | 1 |
| Butter-coconut, Chick-chock, Grace | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 4 pieces | 4 | 1 | 1 |

### BEEF

| Bulgogi/Pho-guee (sirloin) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 serving (200 g/150 g) | 1 | 1 | 1 |
| Galbi | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 serving (200 g) | 1 | 1 | 1 |
| Liver, intestine, Soondae | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1/2 serving (100 g) | 1 | 1 | 1 |
| Saling-tang, Gom-tang, Galbi-tang, other tang | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 serving | 1 | 1 | 1 |
| Beef side dish (a broll, soup, stew, boiled in soy source) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 serving (40 g) | 1 | 1 | 1 |

### PORK

| Samgyeopsal | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 serving (200 g) | 1 | 1 | 1 |
| Food Item                                      | Frequency          | Portion Size     | Less | Same | More |
|-----------------------------------------------|--------------------|------------------|------|------|------|
| Yangnyum-bulgogi, a broll, Galbee             | 0 per month        | 1 serving (200 g)|      |      |      |
| Tangsuyook, Donkak                           | 0 per month        | 1 serving        |      |      |      |
| Sooyouk (Penyook, Bossam, Jockbal)           | 0 per month        | 1/2 serving (5 slices, 70 g) |      |      |      |
| Ham (1), spam (1), Vienna sausage (5)         | 0 per month        | 1 slice of ham/spam, 5 Vienna sausage |      |      |      |
| CHICKEN/EGGS                                  |                    |                  |      |      |      |
| Chicken fry, Yangnyum-tongdak                 | 0 per month        | 2 pieces (180 g) |      |      |      |
| Chicken/duck side dish (Roast, half-boiled, roasted) | 0 per month       | 1 piece (60 g)   |      |      |      |
| Backsuk, Samgye-tang                          | 0 per month        | 1 serving        |      |      |      |
| Egg/quail egg                                 | 0 per month        | 1 egg, 5 quail eggs |      |      |      |
| BEANS                                         |                    |                  |      |      |      |
| Bean curd (regular, soft)                     | 0 per month        | 1/6 piece (80 g) |      |      |      |
| Bean, hard-boiled, boiled in soy sauce        | 0 per month        | 1 Tbsp (20 g)    |      |      |      |
| Bean-paste soup, bean-paste stew, Chungklukjang | 0 per month     | 1 serving        |      |      |      |
| Bean-paste, Samjjang                          | 0 per month        | 1 Tbsp (20 g)    |      |      |      |
| VEGETABLES                                    |                    |                  |      |      |      |
| Raw (wrap, salad, Muchim, etc.)               | 0 per month        | 1 serving (40 g) |      |      |      |
| Cooked (Na-mul, soup, etc.)                   | 0 per month        | 1 serving (70 g) |      |      |      |
| Green vegetables (Spinach, mallow, crown daisy, dropwort, squash, eggplant, Chinese cabbage, bean sprouts, green bean sprouts) | 0 per month | 1 serving (70 g) |      |      |      |
| Fern, tara stalk, sweet potato stalk, radish, balloon flower, lotus root, other roots, garlic in soy sauce, onion, mushrooms | 0 per month | 1 serving (70 g) |      |      |      |
| Napa cabbage/cubed radish/radish kimchi      | 0 per month        | 1/3 cup (40 g)   |      |      |      |
| Watery kimchi, watery radish kimchi, etc.     | 0 per month        | 1/2 cup (with water) |      |      |      |
| Laver                                         | 0 per month        | 1 large piece    |      |      |      |
| Brown seaweed, kelp                           | 0 per month        | 1 serving (70 g) |      |      |      |
| MILK, DAIRY                                   |                    |                  |      |      |      |
| Milk, soy milk                                | 0 per month        | 1 cup (200 g)    |      |      |      |
| Yakurt                                        | 0 per month        | 1 (65 g)         |      |      |      |
| Yogurt (Bulgari, Yople, etc.)                 | 0 per month        | 1 serving (150 g) |      |      |      |
| ice cream                                     | 0 per month        | 1 serving        |      |      |      |
| Cheese                                        | 0 per month        | 1 slice (20 g)   |      |      |      |
| OILS, SWEETS                                  |                    |                  |      |      |      |
| Candy (soft sweet)                            | 0 per month        | 3                |      |      |      |
| Chocolate                                     | 0 per month        | 1 serving (20 g) |      |      |      |
| Soybean oil, corn oil for cooking (pancake, Jun, etc.) | 0 per month     | 1 tsp (5 g)      |      |      |      |
| Olive oil for cooking (pancake, Jun, etc.)    | 0 per month        | 1 tsp (5 g)      |      |      |      |
| Shortening                                    | 0 per month        | 2 tsp (8 g)      |      |      |      |
| BEVERAGES                                     |                    |                  |      |      |      |
| Café Latte, cappuccino, coffee mix            | 0 per month        | 1 cup            |      |      |      |
| Coffee                                        | 0 per month        | 1 cup (2 g)      |      |      |      |
| Added sugar                                   | 0 per month        | 2 tsp (5 g)      |      |      |      |
| Added cream                                   | 0 per month        | 2 tsp (5 g)      |      |      |      |