

## Research Article



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### Conflict of Interest

There are no financial or other issues that might lead to conflict of interest.

# Analysis of eating behavior of Indonesian women from multicultural and non-multicultural families

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## ABSTRACT

**Purpose:** This study aimed to identify the distinctions in dietary and health-related behaviors among Indonesian women who marry Koreans or into multicultural families (MF) and those who marry Indonesians living in Korea (IK) and in Indonesia (II).

**Methods:** The study was performed with 192 subjects using an online questionnaire regarding food choice, dietary and health behavior, and nutrition quotient (NQ). The analysis used Pearson's chi-squared test, the Fisher's exact test, multinomial logistic regression, and the general linear model.

**Results:** The MF group consumed Korean food more than once a day and Indonesian food 1-2 times monthly ( $p < 0.001$ ). The main challenge for the IK and II groups in consuming Korean food was the presence of pork and the different food flavors ( $p < 0.001$ ). The MF group tended to have normal body mass index, consumed more vitamin and mineral supplements ( $p = 0.014$ ), and exercised regularly  $\geq 150$  min/week compared to the IK and II groups ( $p < 0.001$ ). However, the MF group had the highest rate of skipping breakfast ( $p = 0.040$ ). When evaluating the NQ of the participants, the MF group consumed more vegetables ( $p = 0.026$ ), mixed grains ( $p = 0.031$ ), and spicy and salt soups ( $p = 0.006$ ). The II group consumed more fish ( $p = 0.005$ ), beans ( $p = 0.009$ ), and nuts ( $p = 0.003$ ). The IK group checked the nutrition labels the most ( $p = 0.005$ ), while their consumption of vegetables, fish, beans, and nuts was lowest. The MF group had a higher balance score, which resulted in a substantially more nutritious food intake compared to the other two groups ( $p = 0.037$ ).

**Conclusion:** The MF group consumed more vegetables and mixed grains, adequate fish, beans, and nuts, and engaged in longer daily physical activity. However, the IK group had a relatively low-quality diet and nutritional intake status compared to the other two groups, and this needs to be improved in the future.

**Keywords:** cultural diversity; Indonesia; eating behavior; nutritional assessment

## INTRODUCTION

Multicultural families have continuously increased globally, including Korea [1,2]. According to Statistics in Korea, there were 319,000, 335,000, 350,000, and 370,000 multicultural households in 2017, 2018, 2019, and 2020, respectively. The number reached 1.09 million people in 2020, accounting for 2.1% of the population in Korea [3]. The top

### Author Contributions

Conceptualization: Ardina U, Yoon S, Cho JA; Methodology: Ardina U, Yoon S, Cho JA; Formal analysis: Ardina U; Funding acquisition: Cho JA; Investigation: Cho JA; Supervision: Yoon S, Cho JA; Writing - original draft: Ardina U; Writing - review & editing: Yoon S, Cho JA.

nationalities immigrating to Korea are China, Vietnam, Thailand, the USA, Uzbekistan, Russia, the Philippines, Cambodia, Mongolia, Nepal, Indonesia, and Kazakhstan [4]. 42,043 Indonesians were living in South Korea in February 2019. Most are migrant workers, accounting for 33,961 workers, 1524 are students, and the rest are mixed married, professionals, and others [5]. Simultaneously, there has been an increase in Korean men marrying women from Vietnam, Indonesia, and China [6].

Indonesia is the largest archipelagic country in the world [7]. It has a different culture from Korea regarding language, cuisine, and even religion. Frying is Indonesia's most popular cooking method. Koreans use fermenting, boiling, blanching, seasoning, and pickling for food processing [8]. Most of the Indonesian population are Muslim [9]. They are forbidden to eat pork [10]. On the other hand, most Korean food contains pork, with the most popular cut being pork belly [11]. It is a challenge for Indonesians who marry Koreans or Indonesians living in Korea and people in Indonesia who are interested in the Korean wave to eat typical Korean food.

According to Yang [12], 33% of immigrant women from Vietnam, China, the Philippines, and others residing in Gwangju, Korea, reported changing their diet and increasing fruit and vegetable consumption of after immigration to Korea. In addition, the length of residence in Korea was associated with dietary changes, body mass index (BMI), waist circumference, and obesity and inversely associated with disease prevalence. Another study of immigrant women in Busan reported that 64.7% ate Korean food daily, whereas 30.9% ate foods from their home country daily. The higher will to consume Korean foods and intake frequency resulted in a higher adaptation to Korean dietary life [13,14].

Many instruments can be used to determine the quality of dietary intake. One of them is the nutrition quotient (NQ). The NQ developed in Korea is used to comprehensively evaluate individuals' or groups' nutritional status and diet quality [15]. Research conducted by Jung et al., which examined adolescents' dietary behavior from multicultural families, showed that the average NQ score was 48.49, categorized as a low grade [16]. However, research using NQ on immigrant women from multicultural families in Korea is still very limited. Therefore, this study is the first research using NQ on Indonesian women from multicultural families in Korea.

The different cultures and diet styles of Koreans and Indonesians are fascinating. Therefore, as a pilot study, research was carried out to evaluate the dietary behaviors of Indonesian women from multicultural and non-multicultural families. The purpose of this research was to identify the differences in Indonesian women's food choices, diet, health-related behavior, and quality of diet through the NQ from multicultural (Indonesian women who are married to Korean men) living in Korea and non-multicultural families (Indonesian couples) living in Korea or Indonesia.

## METHODS

### Research design and subjects

According to G Power 3.1.9.7. Version, with an effect size of 0.3, power of 80%, and significance level of  $\alpha = 0.05$ , the number of subjects needed to be 190 people for the 3 groups. Considering a 10% (20 people) dropout rate, the final number of subjects was set to 210, 70 people per each group. The participants of the study were Indonesian women aged 19–49 years, married

to Korean or Indonesian men for more than a year, living in South Korea or Indonesia, and not pregnant or breastfeeding. Only 32 people from the multicultural group, 66 people from Indonesian couples living in Korea, and 94 Indonesian couples living in Indonesia fulfilled the criteria for this study.

This research was conducted from September 1 to October 5, 2023, using an online questionnaire through the Google Forms platform. Online questionnaires were distributed to the Indonesian women who joined the “PERCIK” (Indonesian and Korean Mix Marriage community) for multicultural family subjects, “RUMAISA” (Indonesian Muslim who live in Korea), “PERPIKA” (Indonesian student association in Korea) for Indonesian couple subjects in Korea, and “IDEALIST MOMMIES” (Indonesian mother’s community) for Indonesian couple subjects in Indonesia. The questionnaires were shared through community social networks, such as Facebook, KakaoTalk, and WhatsApp. This research obtained approval from the Institutional Review Board (IRB) of Chungnam National University (202307-SB-098-01).

### Data collecting methods

The online questionnaire included general characteristics, food choice behavior, preferred Korean food, dietary behavior, health-related behavior, change in dietary habits, and NQ.

#### *General characteristics*

Most Indonesians who marry Koreans are women, so Indonesian women were chosen as the subjects in this research [5,6]. The age group was categorized as 20s, 30s, and 40s. The marriage age was categorized as 1–5 years, 6–10 years, and more than ten years. The education level was categorized as elementary, junior, high, and university graduate. The occupations were classified as workers, including government officers, private officers, entrepreneurs, teachers, lecturers, and students or housewives/homemakers. The importance of religion was asked because it can affect one’s dietary behavior. The period of stay in Korea was categorized as never, < 12 months (< 6 months and 6–12 months), 1–3 years, 3–5 years, and more than 5 years. The number of children was none, 1, 2, 3, or > 3. Whole expenditure per month (1,000 KRW) was categorized as < 2,000, 2,000–3,000, > 3,000, and food expenditure per month was categorized as < 500, 500–1,000, and > 1,000. The BMI according to the World Health Organization (WHO) Asia-Pacific standard is as follows: underweight: < 18.5, normal: 18.5–22.9, overweight 23–24.9, obesity 1: 25–29.9, and obesity 2: ≥ 30. For obesity, 1 and 2 categories were combined only to be obesity: ≥25. The BMI was obtained from the subject’s height and weight through a self-report (kg/m<sup>2</sup>) [2,17-20].

#### *Food choice behavior*

The food choice behavior included the frequency of eating Korean food, where they usually find Korean food, source for cooking Korean food, Korean style during eating means Korean bapsang contained bowls of rice, soup, banchan, and use chopsticks and spoon, pork consumption, reason for eating Korean food, challenge of eating Korean food, frequency of eating Indonesian food, where usually find Indonesian food, Indonesian eating style means using plate with spoon and fork or immediately with hand [8,17,20,21].

#### *Preferred Korean food*

Preferred Korean food was divided into Korean ramyeon, Korean street food like tteokbokki, odeng, Korean soup like dubu jjigae or kimchi jjigae, Korean popular food like kimbap, bulgogi, jjajangmyeon, japchae, and Korean vegetable like sigeumchi namul [20].

### *Dietary behavior*

Dietary behavior included the breakfast habit, supplement intake, supplement intake frequency, meals eaten at home, dining out, and preference food during dining out [2,22].

### *Health-related behaviors*

The health-related behaviors included sleep hours, daily physical activity, such as walking or cleaning the house, and regular exercise, such as brisk walking, jogging, aerobic dance, home training, yoga, pilates, bicycle, badminton, gym, swimming, and table tennis, duration of physical activity, walking  $\geq 30$  minutes, alcohol intake, smoking behavior, stress level, the reason for the stress included not stress, different culture between Korea and Indonesia, education & occupation, household matters include cleaning, cooking, laundry, and ironing until the care of children, and others such as the economy and far from family, self-reported health problems, medication consumed, and sick in the last 30 days [2,17,20-22].

### *Changes in dietary behavior*

The subjects were asked whether there had been changes in dietary behavior after immigration for those who live in Korea or after being exposed to the Korean wave, such as K-pop/K-drama/K-movie for those who live in Indonesia. What are the changes in diet (for others, such as increasing food intake, decreasing food intake, increasing eating out, eating more fast food, eating meals irregularly, or eating meals regularly)[12].

### *NQ*

There are differentiated NQs for adults, elderly, and children. The NQ for adults aged 19–64 consists of 18 items, including eight items in the balance area (intake of vegetables, fruits, milk/dairy products, fish, beans, nuts, whole grains/multiple grains intake, and frequency of breakfast) and six items in the moderation area (intake of red meat, processed meat, consumption of spicy and salty soups, fast food, greasy baked products or snacks, and frequency of overeating/binge eating), four practice areas (frequency of alcohol drinking, efforts to eat healthy, checking nutrition labels, washing hands). The score of NQ is calculated by assigning 0–100 points to each item.

The balance score addressed the intake frequencies of essential foods were divided into three levels: low (0–30.86), middle (30.86–55.79), and high (55.80–100). The moderation score examines the frequencies of unhealthy food intakes or behaviors that were divided into low (0–66.13), middle (66.13–85.29), and high (85.30–100). The practice score was divided into low (0–51.80), middle (51.80–74.49), and high (74.49–100). The total NQ score was also divided into three levels: low (0–52.73), middle (52.73–68.48), and high (68.48–100). A reverse score, which means a lower score has a higher intake, was used for questions on greasy baked products, fast food, spicy and salt soup, red meat, processed meat, binge eating habits, and alcohol intake [15,23].

### **Data analysis method**

The data were analyzed using SPSS statistical software (version 26; IBM Corp., Armonk, NY, USA). The categorical variables are described as the number and percentage. The continuous variables are the means and SD. Pearson's  $\chi^2$  and Fisher's exact test were performed on categorical variables. A multinomial logistic regression test was used to adjust for categorical variables. The general linear model test was performed on continuous variables. *Post-hoc* multiple comparisons (Scheffe test) were used to compare the subgroups.

## RESULTS

### General characteristics of Indonesian women from multicultural and non-multicultural families in Korea and Indonesia

**Table 1** lists most subjects were in their 30s and had completed their undergraduate degree; multicultural families (MF) are homemakers, while Indonesians living in Korea (IK) and Indonesians living in Indonesia (II) are workers, adhere to the Islamic religion, and highly value religion. In addition, their marriage was between 1 and 5 years. Most of the MF and IK groups had lived in Korea for more than 5 years, 1 to 3 years, respectively. Majority of them have one child. The whole expenditure per month of MF is around 2–3 million Korean won, IK and II < 2 million won. MF and IK around 0.5–1 million Korean won for food expenditure per month. There was no statistically significant difference in BMI distribution among the 3 groups. However, II group has the highest percentage of overweight and obesity (62.8%), while MF group has the highest percentage of normal weight (MF: 50%, IK: 39.4%, II: 29.8%).

### Food choice behaviors of Indonesian women from multicultural and non-multicultural families in Korea and Indonesia

These 3 groups of participants showed a significant difference in food choices ( $p \leq 0.001$ ) in **Table 2**. The MF group had a pattern of consuming Korean food more than one time/day. Although they resided in Korea, the IK only consumed Korean food 1–2 times/month, similar to the II groups. The MF group cooked Korean food, while the IK and II groups mainly purchased it. MF and IK groups admitted that the Internet or YouTube was their source of information when cooking Korean food; only 9.4% of the MF group cited their Korean husbands. Most of the MF group admitted to eating Korean style every day, and most of those in the IK and II groups never ate this way. More than 90% of groups IK and II did not consume pork, potentially due to religious regulations.

Eating Korean food is because MF is married to Korean, and IK lives in Korea. In contrast, group II has the highest percentage of others because of the delicious taste, new experience, following artists or idols, and curiosity about Korean cuisine. Among them, The MF (9.4%), IK (16.7%), and II (4.3%) groups declared that Korean food was healthy. The MF (46.9%) and II (35.1%) admitted that the different tastes and difficulty of cooking Korean food posed the greatest obstacle to their consumption. The IK group stated that pork in Korean food became their big challenge in consuming Korean food. The MF group only consumed Indonesian food 1–2 times/month, while the IK and II groups consumed it daily. Each group prepared Indonesian food independently.

### Preferred Korean foods of Indonesian women from multicultural and non-multicultural families in Korea and Indonesia

Preferred Korean foods differed significantly between the three groups (**Table 3**). Although there is a similar pattern in ramyeon consumption, the IK group (59.1%) preferred to consume Korean street food, such as tteokbokki and odeng, compared to the other two groups ( $p = 0.042$ ). On the other hand, the MF group preferred to consume Korean soup (71.9%), such as kimchi or dubu jjigae ( $p < 0.001$ ), and vegetables (62.5%), such as sigeumchi namul ( $p < 0.001$ ). Almost half of the MF (46.9%) and IK (45.5%) groups enjoy popular Korean foods such as kimbap, japche, and jjajangmyeon ( $p < 0.001$ ).

**Table 1.** General characteristics of Indonesian women from multicultural and non-multicultural family in Korea and Indonesia

Variables	Multicultural families (n = 32)	Indonesians in Korea (n = 66)	Indonesians in Indonesia (n = 94)	p-value <sup>1)</sup>
Age group				0.059
20s	8 (25.0)	23 (34.8)	34 (36.2)	
30s	16 (50.0)	36 (54.5)	55 (58.5)	
40s	8 (25.0)	7 (10.6)	5 (5.3)	
Marriage age				0.499
1–5 yrs	18 (56.3)	32 (48.5)	52 (55.3)	
6–10 yrs	9 (28.1)	16 (24.2)	27 (28.7)	
> 10 yrs	5 (15.6)	18 (27.3)	16 (15.0)	
Education				0.002**
Junior school	1 (3.1)	1 (1.5)	0 (0.0)	
High school	10 (31.3)	5 (7.6)	19 (20.2)	
University	19 (59.4)	36 (54.5)	50 (53.2)	
Graduate	2 (6.3)	24 (36.4)	25 (26.6)	
Occupation				0.004**
Workers	12 (37.5)	31 (47.0)	60 (63.8)	
Students	1 (3.1)	5 (7.6)	0 (0.0)	
Homemakers	19 (59.4)	30 (45.5)	34 (36.2)	
Religion				0.009**
None	1 (3.1)	0 (0.0)	0 (0.0)	
Muslim	25 (78.1)	63 (95.5)	90 (95.7)	
Christianity	3 (9.4)	0 (0.0)	2 (2.1)	
Catholic	2 (6.3)	2 (3.0)	2 (2.1)	
Buddhism	1 (3.1)	0 (0.0)	0 (0.0)	
Hinduism	0 (0.0)	1 (1.5)	0 (0.0)	
Importance of religion				0.003**
No answer	3 (9.4)	1 (1.5)	0 (0.0)	
Not important	0 (0.0)	1 (1.5)	0 (0.0)	
Important	5 (15.6)	12 (18.2)	6 (6.4)	
Very important	24 (75)	52 (78.8)	88 (93.6)	
Stay in Korea				< 0.001***
Never	0 (0.0)	0 (0.0)	94 (100.0)	
< 12 mon	4 (12.5)	11 (16.7)	0 (0.0)	
1–3 yrs	4 (12.5)	30 (45.5)	0 (0.0)	
3–5 yrs	11 (34.4)	13 (19.7)	0 (0.0)	
> 5 yrs	13 (40.6)	12 (18.2)	0 (0.0)	
Children				0.513
None	8 (25.0)	16 (24.2)	12 (12.8)	
1	14 (43.8)	25 (37.9)	39 (41.5)	
2	7 (21.9)	17 (25.8)	28 (29.8)	
≥ 3	3 (9.4)	8 (12.1)	15 (16.0)	
Whole expenditure/month (1,000 KRW) <sup>2)</sup>				< 0.001***
< 2,000	9 (28.1)	48 (72.7)	93 (98.9)	
2,000–3,000	19 (59.4)	16 (24.2)	0 (0)	
> 3,000	4 (12.5)	2 (3.0)	1 (1.1)	
Food expenditure/month (1,000 KRW) <sup>2)</sup>				< 0.001***
< 500	0 (0.0)	15 (22.7)	88 (93.6)	
500–1,000	20 (62.5)	44 (66.7)	6 (6.4)	
> 1,000	12 (37.5)	7 (10.6)	0 (0.0)	
Body mass index				0.090
Underweight	0 (0.0)	5 (7.6)	7 (7.4)	
Normal	16 (50.0)	26 (39.4)	28 (29.8)	
Overweight	2 (6.3)	15 (22.7)	19 (20.2)	
Obesity	14 (43.8)	20 (30.3)	40 (42.6)	

Values are presented as number (%).

<sup>1)</sup>Fisher exact test.

<sup>2)</sup>Group II used Indonesian rupiah currency converted to the Korean won exchange rate on January 31, 2024.

\*\*p &lt; 0.01, \*\*\*p &lt; 0.001.

**Table 2.** Food choice behavior of Indonesian women from multicultural and non-multicultural family in Korea and Indonesia

Variables	Multicultural families (n = 32)	Indonesians in Korea (n = 66)	Indonesians in Indonesia (n = 94)	p-value <sup>1)</sup>
Frequency of eating Korean food				< 0.001***
Never	0 (0.0)	3 (4.5)	36 (38.3)	
1–2 times/month	3 (9.4)	36 (54.5)	57 (60.6)	
1–4 times/week	13 (40.6)	20 (30.3)	1 (1.1)	
≥ 1 times/day	16 (50.0)	7 (10.6)	0 (0.0)	
Source for finding Korean food				< 0.001***
None	0 (0.0)	1 (1.5)	35 (37.2)	
Family or friend	0 (0.0)	3 (4.5)	5 (5.3)	
Buy	3 (9.4)	49 (74.2)	45 (47.9)	
Cook by self	29 (90.6)	13 (19.7)	9 (9.6)	
Source for cooking Korean food				< 0.001***
Never cook	1 (3.1)	13 (19.7)	58 (61.7)	
Internet or YouTube	27 (84.4)	46 (69.7)	34 (36.2)	
Cookbook	0 (0.0)	2 (3.0)	0 (0.0)	
Family/friends	1 (3.1)	5 (7.6)	2 (2.1)	
Husband	3 (9.4)	0 (0.0)	0 (0.0)	
Korean eating style				< 0.001***
Never	2 (6.3)	44 (66.7)	87 (92.6)	
1–3 times/week	8 (25.0)	17 (25.8)	6 (6.4)	
4–6 times/week	1 (3.1)	1 (1.5)	1 (1.1)	
Every day	21 (65.6)	4 (6.1)	0 (0.0)	
Pork consumption				< 0.001***
Yes	10 (31.3)	4 (6.1)	3 (3.2)	
No	22 (68.8)	62 (93.9)	91 (96.8)	
Reason of eating Korean food				< 0.001***
Don't know	0 (0.0)	0 (0.0)	26 (27.7)	
Healthy	3 (9.4)	11 (16.7)	4 (4.3)	
Live & married with Korean	23 (71.9)	28 (42.4)	2 (2.1)	
Others	6 (18.8)	27 (40.9)	62 (66.0)	
Challenge of eating Korean food				< 0.001***
Don't know	2 (6.3)	7 (10.6)	33 (35.1)	
Mostly pork	12 (37.5)	34 (51.5)	14 (14.9)	
Diff taste & difficult to cook	15 (46.9)	15 (22.7)	33 (35.1)	
Others	3 (9.4)	10 (15.2)	14 (14.9)	
Frequency of eating Indonesia food				< 0.001***
1–2 times/month	14 (43.8)	5 (7.6)	0 (0.0)	
1–4 times/week	12 (37.5)	13 (19.7)	7 (7.4)	
≥ 1 times/day	6 (18.8)	48 (72.7)	87 (92.6)	
Source for finding Indonesia food				0.001***
Family or friend	2 (6.3)	0 (0.0)	0 (0.0)	
Buy	10 (31.3)	6 (9.1)	11 (11.7)	
Cook by self	20 (62.5)	60 (90.9)	83 (88.3)	
Indonesian eating style				< 0.001***
Never	8 (25.0)	2 (3.0)	0 (0.0)	
1–3 times/week	13 (40.6)	9 (13.6)	5 (5.3)	
4–6 times/week	3 (9.4)	5 (7.6)	4 (4.3)	
Every day	8 (25.0)	50 (75.8)	85 (90.4)	

Values are presented as number (%).

<sup>1)</sup>Fisher exact test.

\*\*\*p < 0.001.

### Dietary behaviors of Indonesian women from multicultural and non-multicultural families in Korea and Indonesia

The groups had significant differences in breakfast, supplement intake, and frequency (Table 4). More than 50% of groups IK and II had breakfast every day, while the MF group had a higher percentage (18.8%) of skipping breakfast than the other two groups (IK: 6.1%, II: 6.4%) (p = 0.040). On the other hand, approximately 60% of the MF group tended to consume supplements, especially vitamins and minerals, while most of the IK and II did

**Table 3.** Preferred Korean food of Indonesian women from multicultural and non-multicultural family in Korea and Indonesia

Variables	Multicultural families (n = 32)	Indonesians in Korea (n = 66)	Indonesians in Indonesia (n = 94)	p-value <sup>1)</sup>
Korean ramyeon				0.296
Not consumed	22 (68.8)	54 (81.8)	69 (73.4)	
Consumed	10 (31.2)	12 (18.2)	25 (26.6)	
K-street food				0.042*
Not consumed	21 (65.6)	27 (40.9)	53 (56.4)	
Consumed	11 (34.4)	39 (59.1)	41 (43.6)	
Korean soup				< 0.001***
Not consumed	9 (28.1)	41 (62.1)	87 (92.6)	
Consumed	23 (71.9)	25 (37.9)	7 (7.4)	
Popular K-food				< 0.001***
Not consumed	17 (53.1)	36 (54.5)	77 (81.9)	
Consumed	15 (46.9)	30 (45.5)	17 (18.1)	
Korean vegetable				< 0.001***
Not consumed	12 (37.5)	48 (72.7)	91 (96.8)	
Consumed	20 (62.5)	18 (27.3)	3 (3.2)	
Others				0.005 <sup>2)</sup> **
Not consumed	28 (87.5)	59 (89.4)	93 (98.9)	
Consumed	4 (12.5)	7 (10.6)	1 (1.1)	

Values are presented as number (%).

<sup>1)</sup>Pearson's  $\chi^2$  test; <sup>2)</sup>Fisher exact test.

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

not consume any supplements (p = 0.014). A remarkable difference in what was eaten during dining out (p < 0.001). The MF group chose Korean food, while most II groups chose Indonesian food. The IK group had a broader exploration pattern. In addition to Korean and Indonesian food, 30.3% consumed foods from other countries, such as Japanese, Uzbekistan, Turkish, Indian, and Western food.

### Health-related behaviors of Indonesian women from multicultural and non-multicultural families in Korea and Indonesia

Regarding physical activity in **Table 5**, the II group had a higher percentage of people who never performed physical activity (28.7%) than the MF (15.6%) and IK (10.6%) groups (p = 0.003). When performing physical activity, the MF group had the highest duration, 150 minutes or more per week (MF: 43.8%, IK: 27.3%, II: 10.6%) (p < 0.001). The percentage of walking habits every day in the MF (46.9%) group was twice as high as the other groups (IK: 21.2%, II: 18.1%) (p < 0.001). None of the Indonesian women in group II consumed alcohol (100.0%), and only a few people from the MF (12.5%) and IK (1.5%) groups did.

Household matters were the leading cause of stress for MF (31.3%) and II (42.6%) groups, while education and occupation in the IK (40.9%) group. Differences in Indonesian and Korean culture are one of the causes of stress, with the highest percentage in the MF (18.8%) group compared to other groups (IK: 6.1%, II: 0.0%). There are no significant differences in self-reported health problems, but the prevalence of anemia was higher in group II (14.9%) than in groups MF (7.6%) and II (6.3%).

### Change in the dietary behavior of Indonesian women from multicultural and non-multicultural families in Korea and Indonesia

**Table 6** describes how the MF and IK groups admitted that their diets had changed after immigration to Korea (p < 0.001). 37.5% of MF and 33.3% of IK admitted to consuming healthier foods after immigration to Korea. The MF group also eat more Korean food (34.4%) than the IK group (12.1%) after moving to Korea (p < 0.001).



**Table 4.** Dietary behavior of Indonesian women from multicultural and non-multicultural family in Korea and Indonesia

Variables	Multicultural families (n = 32)	Indonesians in Korea (n = 66)	Indonesians in Indonesia (n = 94)	p-value <sup>1)</sup>
<b>Eating breakfast</b>				0.040*
Almost never	6 (18.8)	4 (6.1)	6 (6.4)	
1–2 times/week	7 (21.9)	10 (15.2)	9 (9.6)	
3–4 times/week	4 (12.5)	7 (10.6)	17 (18.1)	
5–6 times/week	2 (6.3)	11 (16.7)	5 (5.3)	
Every day	13 (40.6)	34 (51.5)	57 (60.6)	
<b>Supplement intake</b>				0.014*
None	11 (34.4)	33 (50.0)	57 (60.6)	
Vitamin & mineral	19 (59.4)	28 (42.4)	34 (36.2)	
Weight loss	2 (6.3)	0 (0.0)	1 (1.1)	
Others	0 (0.0)	5 (7.6)	2 (2.1)	
<b>Supplement intake frequency</b>				0.001**
None	11 (34.4)	35 (53.0)	59 (62.8)	
1–2 times/week	3 (9.4)	10 (15.2)	11 (11.7)	
3–4 times/week	1 (3.1)	11 (16.7)	10 (10.6)	
5–6 times/week	1 (3.1)	0 (0.0)	2 (2.1)	
Every day	16 (50.0)	10 (15.2)	12 (12.8)	
<b>Eating at home</b>				0.142
Never	0 (0.0)	1 (1.5)	2 (2.1)	
1 times/day	8 (25.0)	10 (15.2)	7 (7.4)	
2 times/day	14 (43.8)	23 (34.8)	38 (40.4)	
3 times/day	10 (31.3)	32 (48.5)	47 (50.0)	
<b>Dining out</b>				0.705
1–3 times/month	14 (43.8)	41 (62.1)	53 (56.4)	
1–3 times/week	12 (37.5)	18 (27.3)	28 (29.8)	
4–6 times/week	4 (12.5)	4 (6.1)	9 (9.6)	
Every day	2 (6.3)	3 (4.5)	4 (4.3)	
<b>Preferred food in dining out</b>				< 0.001***
Korean food	25 (78.1)	21 (31.8)	0 (0.0)	
Indonesian food	4 (12.5)	25 (37.9)	92 (97.9)	
Others	3 (9.4)	20 (30.3)	2 (2.1)	

Values are presented as number (%).

<sup>1)</sup>Fisher exact test.

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

### Comparison of the NQ scores of Indonesian women from multicultural and non-multicultural families residing in Korea and Indonesia for each item

In **Table 7**, after controlling confounding variables from general characteristics, there were differences in vegetable consumption between the three groups (p = 0.026) due to the confounding period stay in Korea. It is noteworthy that the MF group (39.06 ± 37.53) consumes mixed grains significantly, far more than the IK (14.77 ± 30.69) and II groups (15.43 ± 31.35) (p = 0.031). The MF group consumed considerable amounts of spicy and salt soup (71.09 ± 19.50) (p = 0.006) and a bit of alcohol (p = 0.031). The MF group consumed more milk or dairy products, and the II group washed hands more often than the other groups. However, there was no statistical difference after adjusting due to the period of residence in Korea and food expenditures influencing Indonesian women’s dairy consumption and washing hand habits. Indonesians also usually use their hands directly to eat, so they need to wash their hands.

Similarly, MF groups consumed red meat more than the other groups, but there was no statistical significance after adjusting because of the period of stay, whole, and food expenditure. Therefore, differences in residence are the most critical confounder of these items. Meanwhile, the II group consumed more fish (p = 0.005), beans (p = 0.009), and nuts

**Table 5.** Health related behavior of Indonesian women from multicultural and non-multicultural family in Korea and Indonesia

Variables	Multicultural families (n = 32)	Indonesians in Korea (n = 66)	Indonesians in Indonesia (n = 94)	p-value <sup>3)</sup>
Sleep hours				0.655
< 5 hrs	5 (15.6)	7 (10.6)	14 (14.9)	
6–8 hrs	27 (84.4)	58 (87.9)	80 (85.1)	
> 9 hrs	0 (0.0)	1 (1.5)	0 (0.0)	
Physical activity				0.003**
Never/sometimes	5 (15.6)	7 (10.6)	27 (28.7)	
Daily activity	8 (25.0)	16 (24.2)	7 (7.4)	
Regular exercise	19 (59.4)	43 (65.2)	60 (63.8)	
Duration of physical activity				< 0.001***
Never/no answer	9 (28.1)	15 (22.7)	43 (45.7)	
< 150 minutes	9 (28.1)	33 (50.0)	41 (43.6)	
≥ 150 minutes	14 (43.8)	18 (27.3)	10 (10.6)	
Walking ≥ 30 minutes				< 0.001***
Never	1 (3.1)	2 (3.0)	23 (24.5)	
< 3 times/week	8 (25.0)	20 (30.3)	45 (47.9)	
3–5 times/week	8 (25.0)	30 (45.5)	9 (9.6)	
Every day	15 (46.9)	14 (21.2)	17 (18.1)	
Alcohol consumption				0.002**
Not consume	28 (87.5)	65 (98.5)	94 (100.0)	
1–3 glass/week	3 (9.4)	1 (1.5)	0 (0.0)	
4–6 glass/week	1 (3.1)	0 (0.0)	0 (0.0)	
Smoking				1.000
Never	32 (100)	65 (100)	92 (97.9)	
1–7 cigarettes/week	0 (0.0)	0 (0.0)	1 (1.1)	
> 7 cigarettes/week	0 (0.0)	0 (0.0)	1 (1.1)	
Stress level				0.110
Not stressed	4 (12.5)	8 (12.1)	10 (10.6)	
Little	16 (50.0)	17 (25.8)	45 (47.9)	
Average	9 (28.1)	35 (53.0)	32 (34.0)	
Severe	2 (6.3)	4 (6.1)	6 (6.4)	
Very severe	1 (3.1)	2 (3.0)	1 (1.1)	
Stress reason				0.011*
None	4 (12.5)	4 (6.1)	9 (9.6)	
Culture	6 (18.8)	4 (6.1)	0 (0.0)	
Education & occupation	9 (28.1)	27 (40.9)	32 (34.0)	
Household matters	10 (31.3)	26 (39.4)	40 (42.6)	
Others	3 (9.4)	5 (7.6)	13 (13.8)	
Self-report health problem				0.431
None	13 (40.6)	39 (59.1)	50 (53.2)	
Anemia	2 (6.3)	5 (7.6)	14 (14.9)	
Diabetes	1 (3.1)	0 (0.0)	0 (0.0)	
Obesity	7 (21.9)	10 (15.2)	15 (16.0)	
Hypertension	0 (0.0)	1 (1.5)	3 (3.2)	
Dyslipidemia	1 (3.1)	1 (1.5)	1 (1.1)	
Constipation	3 (9.4)	3 (4.5)	5 (5.3)	
Others	5 (15.6)	7 (10.6)	6 (6.4)	
Taking medication				0.549
Yes	4 (12.5)	4 (6.1)	7 (7.4)	
No	28 (87.5)	62 (93.9)	87 (92.6)	
Sick in last 30 days				0.229
Yes	14 (43.8)	29 (43.9)	53 (56.4)	
No	18 (56.3)	37 (56.1)	41 (43.6)	

Values are presented as number (%).

<sup>3)</sup>Fisher exact test.

\*p &lt; 0.05, \*\*p &lt; 0.01, \*\*\*p &lt; 0.001.

(p = 0.003). In contrast, the IK group consumes the low vegetables, fish, beans, and nuts among the other 2 groups. The transition and adaptation to consumable food availability might cause the low consumption of those foods. Maintaining good habits, such as eating

**Table 6.** The change in dietary behavior of Indonesian women from multicultural and non-multicultural family in Korea and Indonesia

Variables	Multicultural families (n = 32)	Indonesians in Korea (n = 66)	Indonesians in Indonesia (n = 94)	p-value <sup>1)</sup>
Change in diet				< 0.001***
No interest	0 (0.0)	0 (0.0)	14 (14.9)	
Not change	4 (12.5)	17 (25.8)	47 (50.0)	
Change little	16 (50.0)	40 (60.6)	29 (30.9)	
Change a lot	12 (37.5)	9 (13.6)	4 (4.3)	
What changes in diet				< 0.001***
Not change/interest	1 (3.1)	14 (21.2)	60 (63.8)	
Eating more healthy food	12 (37.5)	22 (33.3)	9 (9.6)	
Eating more Korean food	11 (34.4)	8 (12.1)	2 (2.1)	
Others	8 (25.0)	22 (33.3)	23 (24.5)	

Values are presented as number (%).

<sup>1)</sup>Fisher exact test.

\*\*\*p < 0.001.

**Table 7.** Comparison of scores for each item of nutrition quotient of Indonesian women from multicultural and non-multicultural family in Korea and Indonesia

Variables	Multicultural families (n = 32)	Indonesians in Korea (n = 66)	Indonesians in Indonesia (n = 94)	Unadjusted p-value	Adjusted p-value <sup>2)3)</sup>
Intake freq. of vegetable	46.09 ± 27.02	37.88 ± 23.71	45.21 ± 22.68	0.114	0.026*
Intake freq. of fruits	46.09 ± 25.49	50.00 ± 29.74	40.49 ± 29.33	0.131	0.479
Intake freq. of dairy products	45.31 ± 30.08 <sup>b</sup>	40.91 ± 29.63 <sup>a,b</sup>	28.99 ± 27.75 <sup>a</sup>	0.005**	0.976
Intake freq. of fishes	44.53 ± 27.49 <sup>a,b</sup>	34.85 ± 20.51 <sup>a</sup>	51.06 ± 25.90 <sup>b</sup>	< 0.001***	0.005**
Intake freq. of beans/tofu	39.06 ± 22.84 <sup>a,b</sup>	30.30 ± 17.82 <sup>a</sup>	46.81 ± 29.15 <sup>b</sup>	< 0.001***	0.009**
Intake freq. of nuts	43.75 ± 30.45	33.71 ± 24.61	45.21 ± 27.01	0.025*	0.003**
Intake freq. of mix grain	39.06 ± 37.53 <sup>b</sup>	14.77 ± 30.69 <sup>a</sup>	15.43 ± 31.34 <sup>a</sup>	0.001**	0.031*
Intake freq. of greasy baked <sup>1)</sup>	63.28 ± 27.67	61.36 ± 26.01	65.69 ± 28.39	0.615	0.669
Intake freq. of fast food <sup>1)</sup>	69.53 ± 23.53	72.73 ± 20.44	75.27 ± 21.22	0.402	0.970
Intake freq. spicy salt soup <sup>1)</sup>	71.09 ± 19.50 <sup>a</sup>	82.20 ± 19.50 <sup>b</sup>	80.05 ± 20.60 <sup>a,b</sup>	0.034**	0.006*
Intake freq. of red meat <sup>1)</sup>	63.28 ± 25.39 <sup>a</sup>	63.26 ± 22.88 <sup>a</sup>	75.00 ± 22.30 <sup>b</sup>	0.002**	0.098
Intake freq. processed meat <sup>1)</sup>	74.22 ± 28.74	71.59 ± 22.74	76.33 ± 21.80	0.453	0.152
Breakfast habits	59.38 ± 42.00	70.45 ± 34.78	73.14 ± 35.78	0.185	0.910
Binge eating habits <sup>1)</sup>	79.38 ± 24.62	80.91 ± 20.88	79.57 ± 21.15	0.914	0.059
Healthy eating habit	71.09 ± 20.19	70.45 ± 18.56	76.33 ± 21.80	0.160	0.845
Check of nutrition label	69.53 ± 36.88 <sup>a</sup>	89.39 ± 21.51 <sup>b</sup>	79.52 ± 28.39 <sup>a,b</sup>	0.004**	0.005**
Washing hand before eating	92.19 ± 16.11 <sup>a,b</sup>	89.39 ± 15.23 <sup>a</sup>	96.54 ± 10.75 <sup>b</sup>	0.004**	0.368
Intake freq. of alcohol <sup>1)</sup>	93.13 ± 14.01 <sup>a</sup>	98.48 ± 8.09 <sup>b</sup>	100.0 ± 0.00 <sup>b</sup>	< 0.001***	0.031*

Values are presented as mean ± standard deviation.

<sup>1)</sup>Reverse scoring (lower score is higher intake).

<sup>2)</sup>General linear model.

<sup>3)</sup>Adjusted for education, occupation, religion, importance of religion, period of stay in Korea, whole expenditure per-month and food expenditure for per-month.

<sup>a,b</sup>Different superscripts in a row indicate significant differences by Scheffe multiple range test.

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

fish, beans, and nuts, is essential for the IK group, even though they live in Korea. Still, the IK group checked nutrition labels the closest (p = 0.005).

### Comparison of scores for NQ of Indonesian women from multicultural and non-multicultural families in Korea and Indonesia

After adjusting from characteristic bias, although there were no significant differences in the mean score of moderation, practice, and the NQ grade, balance differed significantly between groups (**Table 8**). The balance's mean score of the MF group (45.96 ± 18.67) was significantly greater than those of the IK (41.25 ± 16.21) and II (43.99 ± 15.65) groups both in continuous and categorical variables (p = 0.037, p = 0.017), indicating that MF consumes essential foods frequently such as vegetable, milk/dairy products, fish, beans, nuts, whole grains/multiple grains intake. Meanwhile, there were no significant differences between the moderation and practice categories after characteristic adjusting and total NQ scores between the three groups. There are statistical differences in practice due to religion,

**Table 8.** Comparison of nutrition quotient grade of Indonesian women from multicultural and non-multicultural family in Korea and Indonesia

Variables	Multicultural families (n = 32)	Indonesians in Korea (n = 66)	Indonesians in Indonesia (n = 94)	Unadjusted p-value	Adjusted p-value <sup>5)</sup>
Balance	45.96 ± 18.67	41.25 ± 16.21	43.99 ± 15.65	0.361 <sup>1)</sup>	0.037 <sup>1)*</sup>
Low	9 (28.1)	18 (27.3)	15 (16.0)	0.127 <sup>2)</sup>	0.017 <sup>4)*</sup>
Middle	13 (40.6)	37 (56.1)	59 (62.8)		
High	10 (31.3)	11 (16.7)	20 (21.3)		
Moderation	71.07 ± 18.56	72.00 ± 13.90	75.43 ± 12.78	0.188 <sup>1)</sup>	0.101 <sup>1)</sup>
Low	11 (34.4)	18 (27.3)	20 (21.3)	0.342 <sup>2)</sup>	0.115 <sup>4)</sup>
Middle	12 (37.5)	35 (53.0)	55 (58.5)		
High	9 (28.1)	13 (19.7)	19 (20.2)		
Practice	79.11 ± 14.13 <sup>a</sup>	83.49 ± 10.92 <sup>a,b</sup>	85.49 ± 12.51 <sup>b</sup>	0.041 <sup>1)*</sup>	0.192 <sup>1)</sup>
Low	1 (3.1)	0 (0.0)	1 (1.1)	0.037 <sup>3)*</sup>	0.605 <sup>4)</sup>
Middle	11 (34.4)	13 (19.7)	13 (13.8)		
High	20 (62.5)	53 (80.3)	80 (85.1)		
NQ grade	66.75 ± 11.74	66.99 ± 9.31	70.02 ± 9.02	0.084 <sup>3)</sup>	0.332 <sup>3)</sup>
Low	5 (15.6)	4 (6.1)	2 (2.2)	0.085 <sup>3)</sup>	0.512 <sup>4)</sup>
Middle	10 (31.3)	29 (43.9)	38 (40.9)		
High	17 (53.1)	33 (50.0)	57 (53.0)		

Values are presented as mean ± standard deviation and number (%).

NQ, nutrition quotient.

<sup>1)</sup>General linear model, <sup>2)</sup>Pearson's  $\chi^2$  test, <sup>3)</sup>Fisher exact test, <sup>4)</sup>Multinomial logistic regression.

<sup>5)</sup>Adjusted for education, occupation, religion, importance of religion, period of stay in Korea, whole expenditure per-month and food expenditure per-month.

<sup>a,b)</sup>Different superscripts in a row indicate significant differences by Scheffe multiple range test.

\*p < 0.05.

importance of religion, and period of stay in Korea variables. One component of the practice is the habit of drinking alcohol, which is closely related to religion.

## DISCUSSION

The main findings showed that although they were all Indonesian women, there were differences in diet patterns among those who married Koreans and those who lived in Korea and Indonesia. MF group cooks and consumes more Korean food, supplements, vegetables, mixed grains, spicy and salt soup, and alcohol. They tend to have a normal weight and exercise regularly. On the other hand, the IK group tends to explore other foreign and Korean street foods and often checks the nutrition labels, but they are lower in consumed vegetables, fish, beans, and nuts. One of the biggest challenges they face in consuming Korean food is the presence of pork. At the same time, the II group consumes Indonesian food regularly and has a higher intake of fish, beans, tofu, and nuts. However, they tend to be overweight or obese. Hence, the husband's nationality influences the wife's dietary patterns. Not only that, if a husband and wife are from the same nationality but live in another country, their diet patterns will also be affected, possibly because of food availability or the environment that encourages these changes.

Marriage and starting a family might influence a person's life. Like Indonesian women who marry Koreans and live in Korea, their diet patterns changed. Almost every day, multicultural families consume Korean food and less of their homeland food [13,20]. In addition, the MF group preferred to consume Korean soup, vegetables, and popular Korean foods because these foods are home-cooked meals for the family. Furthermore, Muslim subjects replace the pork ingredient with beef or chicken.

Korea is one of the countries with the highest pork consumption globally [24]. Moreover, almost all Korean food uses pork as an ingredient. It could affect foreigners (including

Muslims) who live in Korea because many restaurants serve pork, which makes it difficult for Muslims to find halal food [25]. Kremmer's research [26] says married couples can influence each other's consumption patterns. In the MF group, non-pork consumption, which is lower than the percentage of Islamic adherents, may indicate the influence of the environment and husbands and their families on pork consumption. Moreover, religious tolerance varies from person to person; they might consume pork even though it is prohibited in their religion.

The Korean wave refers to the rise in popularity of Korean culture worldwide. Many admirers worldwide adore Korean dramas, films, and popular music (K-pop) [27]. Traveling to Korea has also become a favorite destination in recent years [28]. The Korean wave affects the entertainment world and can influence consumer eating patterns [29]. Many imported products from Korea enter Indonesia, one of which is instant noodles or ramyeon. Most instant noodles that enter Indonesia already have a halal certificate [30], meaning Muslims can consume them without worrying about pork ingredients and contamination. However, halal ramyeon and other typical Korean food is very rare in Korea, so it is challenging for foreign Muslims to consume it. Kwon [31] reported that many foreign people are interested in Korean food and diets because of its history and healthiness. Korean food has embedded 3 values for thousands of years: respect and looking out for others, balance and harmony, and health.

Many studies show that breakfast has many relationships, such as improving performance and learning achievement and reducing the risk of cardiovascular disease, overweight, and obesity [32-34]. Skipping breakfast in Korea has a reasonably high trend [35]. In line with this research, women in the MF group had a higher percentage of skipping breakfast than the other two groups. Korean people skipped breakfast because there was not enough time to prepare food, and the person who usually prepared food was the wife or mother in the family [36]. Group II is likely to consume breakfast every day. Indonesians who eat breakfast have higher achievement scores at school and good work performance [37]. Unfortunately, the quality of Indonesian breakfast still contains low level of dietary fiber and micronutrients, and high levels of saturated fat [38]. So there needs to be a campaign about a healthy breakfast rather than just breakfast.

Indonesia has one of the highest numbers of motorbike users [39]. Therefore, many people go to places short distances away by motorbike [40]. Coupled with infrastructure that is not pedestrian-friendly, it might explain why the physical activity levels in Indonesia are deficient compared to the recommended duration by the Indonesian Ministry of Health [41].

Indonesians' vegetable and fruit consumption is less than half of the national recommendation. Despite this, Indonesia has one of the world's highest consumption levels of fish and soy products, such as tofu and tempeh [42]. In our results, MF had the highest vegetable consumption, followed by the II group, which consumed fish, beans, tofu, and nuts. Unfortunately, the IK group had the lowest consumption of vegetables, fish, beans, and nuts. Their adaptability and temporary living in Korea may encourage them to consume less vegetables, fish, beans, and nuts. It is important for Indonesian people who migrate to Korea to consume fish, beans, and nuts and manage their dietary habits in new environments through study or employment [43].

Korea is one of the countries that consumes an adequate amount of mixed grains [44]. Women from MF group consume more mixed grains, possibly due to the influence of their Korean husbands in their homes and families. Furthermore, they also consume a lot of spicy

and salt soup. According to Hwang et al. [45], spicy and salt soup consumption in Korea is still high. Indonesian women from Indonesian couples who live in Korea check nutrition labels more often than other groups. Besides looking for the nutrition label, checking is done to see whether the composition is halal so that the food can be consumed [46].

The limitation of this research is that it did not involve MF in Indonesia and had no direct anthropometric and laboratory examination. However, this is the first research study to observe the difference in dietary behavior between multicultural Korean and Indonesian families and the challenges Indonesians face when marrying a Korean or living in Korea.

## SUMMARY

This study sheds light on how marriage and location can significantly affect a person's lifestyle and dietary habits. Indonesian women married to Koreans or living in Korea have different eating patterns than those in Indonesia. Women married to Koreans tend to consume more Korean food and essential foods such as vegetables and multi-grain and exercise regularly. Additionally, consume vitamin and mineral supplements. On the other hand, women living in Korea are more conscious of nutrition labels, although having the lowest intake of vegetables, fish, beans, and nuts, contrary to women in Indonesia. Bringing Indonesian healthy habits to Korea is necessary for the IK group to maintain good health. Coupling with healthy habits from Korea, such as more vegetables, mixed grains intake, and exercise, will enhance the quality of life of Indonesian women. Further research involving multicultural families in Indonesia is recommended to examine the influence of partners and place of residence. Additionally, immediate body assessments and biological examinations should be carried out.

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