Judul Artikel: Highlighting of Urinary Sodium and Potassium among Indonesian Children Aged 9-12 Years: The Contribution of School Food

1028672: Acknowledging Receipt

Journal of Nutrition and Metabolism

Dear Dr. Farapti,

The Research Article titled "Highlighting of Urinary Sodium and Potassium Among Indonesian Schoolchildren Aged 9-12 Years: The Contribution of School Food," by Farapti Farapti, Muji Sulistyowati, Kurnia Dwi Artanti, Stefania Widya Setyaningtyas, Sri Sumarmi and Bibit Mulyana has been received and assigned the number 1028672.

All authors will receive a copy of all the correspondences regarding this manuscript.

Thank you for submitting your work to Journal of Nutrition and Metabolism.

Best regards,

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Monica Nabil Tawfik
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1028672: Minor Revision Required

C. S. Johnston

Dear Dr. Farapti,

Following the review of your Research Article titled "Highlighting of Urinary Sodium and Potassium Among Indonesian Schoolchildren Aged 9-12 Years: The Contribution of School Food" by Farapti Farapti, Muji Sulistyowati, Kurnia Dwi Artanti, Stefania Widya Setyaningtyas, Sri Sumarmi and Bibit Mulyana, I recommend that it should be revised taking into account the changes requested by the reviewer(s). As the submitting author, please log in to the Manuscript Tracking System to read the submitted review report(s) and submit the revised version of your manuscript no later than Tuesday, February 12, 2019.

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Best regards,

C. S. Johnston

1028672: Your manuscript has been accepted

C. S. Johnston

Dear Dr. Farapti,

The review process of Research Article 1028672 titled "Highlighting of Urinary Sodium and Potassium Among Indonesian Schoolchildren Aged 9-12 Years: The Contribution of School Food" by Farapti Farapti, Muji Sulistyowati, Kurnia Dwi Artanti, Stefania Widya Setyaningtyas, Sri Sumarmi and Bibit Mulyana submitted to Journal of Nutrition and Metabolism has been completed. I am pleased to inform you that your manuscript has now been accepted for publication in the journal.

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Best regards,

C. S. Johnston

1028672: Your article has been published

Monica Nabil Tawfik

Dear Dr. Farapti,

I am pleased to let you know that your article has been published in its final form in "Journal of Nutrition and Metabolism."

Farapti Farapti, "Highlighting of Urinary Sodium and Potassium among Indonesian Schoolchildren Aged 9–12 Years: The Contribution of School Food," Journal of Nutrition and Metabolism, vol. 2019, Article ID 1028672, 8 pages, 2019.

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Research Article

Highlighting of Urinary Sodium and Potassium among Indonesian Schoolchildren Aged 9–12 Years: The Contribution of School Food

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1 *Background*. Sodium (Na) and potassium (K), the essential nutrients, have vital role in promoting cellular growth including growth and development of children. Excessive Na intake and inadequate K consumption, which consequently increases the risk
2 of cardiovascular disease, have been reported. Spot electrolyte urine was highly correlated and validated with gold standard to estimate electrolyte dietary intake. This study aimed at predicting sodium and potassium intake using morning spot urine among Indonesian schoolchildren. *Methods*. A cross-sectional study was carried out in 155 healthy elementary students aged 9–12 years. Spot urine samples were collected and analyzed for Na, K, and creatinine. Predicted 24 h Na and K excretions were compared to the Indonesian recommendation dietary allowances. The Na and K contribution from school food was reported by observing directly and the dietary recall method. *Results*. A total of 80 boys and 75 girls recruited as samples in this study demonstrated that their estimated urinary Na and K were 105.42 ± 66.05 mmol/day and 16.39 ± 12.57 mmol/day, respectively. Na intake was on average higher than recommended; meanwhile, almost all subjects showed very low compliance of K intake recommendation. Furthermore, Na and K content of school food were 33% and 29% contribute of the daily intakes each nutrient, and contributed
3 125% and 25%, respectively, compare to nutritional school standard. *Conclusions*. Indonesian schoolchildren aged 9–12 years are categorized by excessive Na intake and very deficient K intake. The present study highlights the need for policies in the en-
4 vironmental school setting to reduce Na intake and increase dietary K.

1. Introduction

Sodium (Na) and potassium (K) are two essential nutrients having an important role in normal bodily functioning. Na and K are two principal electrolytes in extracellular fluid and intracellular fluid, respectively, which together have a vital role in regulating body fluids, maintaining osmotic equilibrium, stabilizing acid-base balance, determining membrane potentials of smooth muscles and nerves, regulating molecules to transport actively across cell membranes, and promoting cellular growth [1]. It is widely known that excessive sodium consumption and deficit of potassium intake have an important role in the pathogenesis of hypertension and more strongly associated with blood pressure than either Na or K alone [2, 3]. Furthermore, epidemiology studies have revealed that high Na and low K intake alone and together have risk for adverse health effects such as cardiovascular diseases [4, 5], stroke [6], chronic kidney disease [7], obesity [8], and all-cause mortality [9].

Population studies reported that most population around the world consume less than the recommended intake of K; however, unfavorably high Na intakes remain

prevalent around the world. The part played by these nutrients has been thoroughly studied in adults and children, but most studies have been concerned with adults [10, 11]. The studies on the effect of Na and K directly on children were few; a previous study reported that Na and K were
5 associated with hypertension and obesity among children [12]. A prospective study showed people with excess salt intake and hypertension at an early age are more likely to develop hypertension, cardiovascular disease, and stroke in the future [13].

Since dietary habits established in childhood can generally be tracked into adulthood and the risk of many noncommunicable diseases is closely related with dietary intakes, concerning dietary habits at early age is very crucial to prevent future diseases and increase beneficial effects on human health [13, 14]. Recent studies described unhealthy dietary intakes are common among children; it was related to low nutrition knowledge, preference, and bad dietary habits in children [15, 16]. The nutrients, for instance, Na and K intake, are closely related with dietary habits in children. Sodium is mostly used in the form of sodium chloride (salt), and it is the widely used ingredient in the
6 processed food. The addition of salt to food will improve the flavor, which also increases saltiness and suppresses bitterness. A previous study revealed that children prefer higher salt taste than adults do and the addition of salt to foods increases children's consumption of those foods and causes excessive sodium consumption [17]. On the other hand, deficit potassium intakes in children have been reported by several researchers from many countries. Although diets containing abundant fruits and vegetables are potassium rich, it was known that children consume fruits and vegetables less than 20% of recommended [18].

Twenty-four-hour urine collection is gold standard to assess dietary Na and K; however, this method is difficult to perform and not convenient in studies involving children [19]. Spot urine Na and K are well documented and proven accurately in predicting 24 h urinary Na and K levels among adults and children [20, 21]. In Indonesia, most studies assessing Na and K intake were performed with dietary assessment methods; no data were available for obtaining these nutrients in children by urinary excretion. Since dietary Na and K can be a useful marker and predictor of dietary quality related to human health and because of limited scientific data supporting, it is important to examine Na and K intake among young population.

Therefore, the study aimed at assessing and evaluating urinary Na and K using morning spot urine among Indonesian subjects aged 9–12 years with the focus on evaluating dietary Na and K in children on the day of the school since schoolchildren spent one-third of their time at the school.

2. Materials and Methods

This cross-sectional study, which was conducted between April and October 2018, enrolled the students from elementary school (9- to 12-year-olds) in Indonesia. We studied 155 Indonesian subjects from the school at Surabaya, one of the metropolitan areas in Indonesia. To accomplish this project, children attending the 4th and 5th grade were recruited as subjects in this study after getting permission from the headmaster. Prior to data collection, all students had been explained and given written information about informed consent on the project, and then it had been granted to children to get parental permission and signature; thus, written consent was obtained from the child, as well as the child's parent. Informed consent was arranged in accordance with the ethical standards laid down in the Declaration of Helsinki, and the Ethical Committee of Faculty of Public Health, Universitas Airlangga, approved the protocol of this study with the ethical number 446-KEPK.

2.1. Data Collection and Demographic Characteristics. Data collection was done through structured interviews, anthropometric measures, questionnaires, collection of spot morning urine sample, and 2×24 h dietary recall by trained researchers. Sociodemographic characteristics, namely, age, sex, class grade, and pocket money, were obtained by trained researchers using a structured questionnaire. A research team supported children to complete urine collection and to collect anthropometric measures.

2.2. Anthropometric Measures. The collection of anthropometric data including height and weight was measured using standard protocols (wearing light clothing, with shoes removed) by trained researchers. Body weight measurement was obtained by using an electronic scale (TANITA® TBF-300A, capacity 200 kg, accuracy 100 g), and the height was obtained using a stadiometer (capacity 200 cm, accuracy 1 mmol). Body mass index (BMI) was computed as kg/m^2. Body mass index (BMI) values were converted to age-adjusted and sex-adjusted BMI *z*-scores and then it was plotted on the WHO BMI-for-age growth charts and obtained a percentile ranking, classifying children as underweight (less than the 3rd percentile), normal weight (3rd to less than the 85th percentile), overweight (85th to less than the 97th percentile), or obese (equal to or greater than the 97th percentile) [22].

2.3. Dietary Intake and School Food. A nutritionist interviewed and recorded dietary energy and macronutrient intake of subjects by asking subjects to recall a two-day food intake during a week of data collection. Participants were observed twice at mealtime on the same day (weekday) of recalling food intake. The food items consumed on the day of the school were recorded including home-packed lunch, school lunch meal, and canteen foods. Portion and sizes of school food were estimated using household measures. The nutritionist clarified the accuracy of data by clarifying menu, portion, and size of the foods consumed by the subjects using food model and Indonesian food book [22, 23]. The contribution percentage of nutrient intake on the school food (energy, sodium, and potassium) was calculated by dividing those dietary intakes while at the school by those daily intakes. The requirement percentage of nutrient intake on the school food was obtained by dividing those dietary intakes while at school by those based on school food standard.

2.4. Urinary Sodium, Potassium, and Creatinine Excretion. The Na and K intake in this study was estimated based on urinary Na and K excretion. The day before urine collection, all participants were given written and verbal instructions on how to collect spot urine correctly. The first urine of the day was collected in the bottles provided by the researcher. Then, the pupils brought the urine bottle to school and gave it to the researcher team to be delivered at laboratory. Urinary Na and K concentration was assessed by the indirect ion-selective electrode method [24], whereas urinary creatinine was assessed using the Jaffe reaction [25].

2.5. Estimation of 24 h Sodium, Potassium, and Creatinine. Analysis of urine was performed on the first morning sample. Estimation of the daily urinary electrolyte excretion to creatinine (Cr) ratio in spot urine samples was reported to depend on the accuracy of predicting urinary 24 h Cr calculated based on the data by Remer et al. [26]. Urinary Na/Cr or K/Cr was calculated as follows: (urine Na or K in mmol/L)/(urine creatinine in mg/dl) × 0.0883.

The molecular weights of Na (23 g/mol) and K (39 g/mol) were used to convert millimoles of Na and K, respectively, to milligrams. The results of urinary Na and K excretion data are presented as mmol/day and mg/day as well as the salt equivalent. Salt equivalents were calculated by dividing Na concentration in mg by 390.

2.6. Statistical Analysis. Statistical analysis was conducted using SPSS 21 (IBM SPSS), and two-sided p values less than 0.05 were considered statistically significant. The Kolmogorov–Smirnov test was performed to test variables for normality. Descriptive statistics were used to describe participant characteristics. Continuous variables were summarized as mean and standard deviation, and categorical variables were presented as counts/numbers and percentages. Independent samples t-test and the Mann–Whitney test were used to identify sex differences for urinary electrolyte excretion. The one-way ANOVA test and post hoc test were used to analyze factors contributing estimated Na and K intake.

3. Results

A cross-sectional study was performed between April and October 2018. A total of 155 healthy primary students (9–12 years) were randomly selected using a multistage cluster sampling procedure from approximately 305 pupils from the 4th and 5th grade at Surabaya elementary school in Indonesia. A total of 80 boys and 75 girls were recruited as samples in this study. From Table 1, it can be seen that the average age was 10.15 ± 0.77 years and the mean body mass index was 19.53 ± 4.4 kg/m^2 with 23.9% of subjects categorized as obese. The median daily pocket money was Rp10000 with a mean of Rp11954.84 ± 5.197.83.

Table 2 demonstrates that all variables of urinary excretion were similar in boys and girls ($p > 0.05$). The estimated urinary Na or predicted Na intake was 105.42 ± 66.05 mmol/day, equivalent to 6.17 g/d of salt. By contrast, mean urinary K excretion was 16.39 ± 12.57 mmol/day or 639.15 ± 490.04 mg/d; the estimated average daily K intakes for boys and girls were 17.37 mmol and 15.34 mmol, respectively. Consequently, the mean of the Na/K ratio was 7.71 ± 4.02 (mmol) or 4.55 ± 2.37 (mg).

Table 1: Baseline characteristics of the study participants (n = 155).

Variable	Frequency or mean ± SD	Percentage
Age (years)	10.15 ± 0.77	
9-10	104	67.1
11-12	51	32.9
Gender		
Boys	80	51.6
Girls	75	48.4
School grade		
4th grade	96	62
5th grade	59	38
Body weight (kg)	39.84 ± 11.84	
Body height (cm)	141.73 ± 7.6	
BMI (kg/m^2)	19.53 ± 4.4	
Nutritional status (BMI z-score)	0.69 ± 1.64	
Underweight	10	6.5
Normal weight	68	43.9
Overweight	40	25.8
Obesity	37	89.67
Pocket money (Rp)	11954.84 ± 5197.83	

Seventy-four percent of children had Na consumption higher than 1500 mg/d, and 41.3% of subjects consumed Na intake more than 2300 mg/d. For estimated K intake, only 11.6% and 3.9% of the subjects consumed K intake higher than 1000 mg/d and 2000 mg/d, respectively (Table 3).

The data of dietary intake (energy, Na, and K) from the dietary method were presented as mean and standard deviation in Table 4. It can be seen that the total energy intake of subjects was 1896.55 ± 276.4 kcal/d, and 42.76% was obtained from the food on the day at school. The Na content of the school food was 606.9 ± 218.9 mg and contributed nearly one-third percent from daily Na intake. On the contrary, the K content of the school food contributed only 29.78% compared to daily intake, and these intakes contribute only a quarter percent based on nutritional school standard.

Table 5 gives a description of factors contributing estimated Na and K intake. For Na intake, there were no significant differences in age, amount of pocket money, and energy in full day; however, BMI z-score and body weight were significantly associated with estimated Na intake. Furthermore, it is observed from the post hoc test that compared to group 1 (<1500 mg/d) energy of school food was significantly higher in group 3 (2300 mg/d) with p value 0.04. For K intake, the median value of 500 mg/d was categorized as group 1 and higher than 1000 mg/d as group 3. As can be seen, BMI z-score, body weight, and energy of school food correlated significantly with estimated K intake.

4. Discussion

Sodium (Na) and potassium (K) have been the main topics in recent years since these nutrients have been closely related to the risk of many noncommunicable diseases in adults and children [9, 13]. Moreover, in the industrialized nations

7 Table 2: Electrolytes spot urinary excretion and predicted 24 h electrolytes urinary.

Variable	Total ($n = 155$)	Boys ($n = 80$)	Girls ($n = 75$)	p
Urinary Na/Cr (mmol/mmol)	18.16 ± 11.69	17.96 ± 10.01	18.36 ± 13.31	0.833
Urinary K/Cr (mmol/mmol)	2.77 ± 1.99	2.81 ± 1.98	2.73 ± 1.98	0.784
P24 h Na (mmol/d)	105.42 ± 66.05	105.72 ± 50.75	105.11 ± 79.55	0.406
P24 h Na (mg/d)	2424.77 ± 1519.09	2431.5 ± 1167.15	2417.58 ± 1829.75	
P24 h K (mmol/d)	16.39 ± 12.57	17.37 ± 13.44	15.34 ± 11.55	0.764
P24 h K (mg/d)	639.15 ± 490.04	677.49 ± 524.32	598.25 ± 450.52	
Urinary Na/K (mmol/mmol)	7.71 ± 4.02	7.84 ± 4.48	7.57 ± 3.48	0.963
Urinary Na/K (mg/mg)	4.55 ± 2.37	4.63 ± 2.64	4.47 ± 2.05	

Table 3: Estimated/predicted Na and K intake and percentage based on Indonesian RDA (%).

Na intake	Total (155), n (%)	Boys (80), n (%)	Girls (75), n (%)
Estimated Na intake			
<1500 mg/d	40 (25.8)	16 (20)	24 (32)
1500–2300 mg/d	51 (32.9)	30 (37.5)	21 (28)
>2300 mg/d	64 (41.3)	34 (42.5)	30 (40)
Estimated K intake			
<1000 mg	137 (88.4)	66 (82.5)	71 (94.7)
1000–2000 mg	12 (7.7)	9 (11.2)	3 (4)
>2000 mg	6 (3.9)	5 (6.3)	1 (1.3)
≥4500 mg	0	0	0

8 Table 4: The percentage of school food nutritional was compared to those daily intake and school standard.

Variable	Full-day food, mean ± SD	School food, mean ± SD	Percentage of school food compared to daily intake	Percentage of school food compared to nutritional school standard
Energy (kcal)	1896.55 ± 276.4	810.9 ± 98.14	42.76	128.7
Sodium (mg)	1820.93 ± 994.06	606.9 ± 218.9	33.33	124.8
Potassium (mg)	1319.82 ± 906.07	393.12 ± 250.9	29.78	24.96

where the majority intake comes from processed food and commercially packaged foods, it is globally known that most people have excessive Na (salt) consumption and deficit of K intake. Recently, it was found that high Na (salt) and or low-potassium diet become public health problem in the worldwide [9–11].

Assessing dietary Na and K by using urinary excretion had been performed in several countries including Indonesia [27]. However, according to our best knowledge, the present study is the first Indonesian study using urinary electrolyte excretion to assess these nutrients in children aged 9–12 years since there are no scientific data to explain this condition in Indonesian children. Our study involved children subjects aged 9–12 years at elementary school; the school children aged 9–12 years were categorized as pre-early adolescent, and it is reasonably narrow that they can think logically, awareness, and responsibility to their selves
9 to consider with food choices [17, 28].

In our study, predicted 24 h Na excretions were assumed to reflect 24 h Na intakes. This study with a total of 80 boys and 75 girls recruited as samples demonstrated that predicted Na intake was 105.42 ± 66.05 mmol/day or
10 2424.77 ± 1519.09 mg/d, equivalent to 6.17 g/d of salt. These findings are similar to those observed by Service et al. [29] in a study of 168 children aged 9–12 years in which Na intake of approximately 110 ± 53 mmol/d, the 103 ± 43 mmol/d observed by Grimes et al. [30] in 193 Australian subjects aged 5–13 years, and 113 ± 3 mmol/day reported in Australian salt and other nutrients in children (SONIC) study among 383
children aged 9–12 years [31]. On the other hand, several 11
authors have reported higher intakes: 132.7 ± 51.4 mmol/d reported by Aparicio et al. [32] in 205 Spanish children aged 7–11 years and the 129 mmol/d among boys and 117 mmol/d among girls from Italian children with a mean age of 10.1 ± 2.9 years [12]. However, lower urinary Na excretion than our findings was reported by El Mallah et al.'s [21] study of 96.57 ± 61.67 mmol/d among 1403 Lebanese children aged 6–10 years, 97.19 mmol/day among Morocco children aged 6–18 years [33], 80.7 ± 3.4 mmol/d observed by Marrero et al. [34] in 111 British (South London) subjects aged 8-9 years, and the median of 94.4 and 95.0 mmol/24 h was reported by Libuda et al. [35] in a group of German male and females,
respectively, aged 10–13 years. 12

Assuming that the Na eliminated in urine arose from the diet, the Na intake in our study was classified as high (161.65%) compared to Indonesian RDA for children aged 9–12 years (1500 mg/d) [36]. Moreover, 80% of the boys and 68% of the girls had Na consumption higher than the recommended age-specific standard dietary target. The Institute of Medicine (IOM) has suggested a recommended upper Na intake amount of 2300 mg/d (100 mmol/d) [1]. In our findings, 41.3% of subjects had Na intake higher than the WHO recommended and 74.2% of children had Na intake higher than the Indonesian recommended age-specific

Table 5: Factors contributing estimated Na and K intake.

Variables	Estimated Na intake							Estimated K intake						
	<1500 mg/d ($n = 40$)	1500–2300 mg/d ($n = 51$)	>2300 mg/d ($n = 64$)	p	Post hoc tests			<500 mg/d ($n = 78$)	500–1000 mg/d ($n = 59$)	>1000 mg/d ($n = 18$)	p	Post hoc tests		
Age (years)	10.18 ± 0.59	10 ± 0.8	10.25 ± 0.84	0.219[1]	0.28[2]	0.08[3]	0.63[4]	10.19 ± 0.76	10.05 ± 0.79	10.28 ± 0.75	0.48	0.29	0.28	0.67
Pocket money (Rp)	11800 ± 4479.013.12	12000 ± 6118.82	12015.63 ± 4887.6	0.977	0.86	0.98	0.84	11897.44 ± 5539.91	11661.02 ± 4674.25	13.166.67 ± 5415.12	0.89	0.79	0.28	0.35
BMI z-score	−0.07 ± 1.55	0.61 ± 1.52	1.22 ± 1.61	0.001*	0.04	0.04	0.00	0.49 ± 1.62	0.65 ± 1.67	1.65 ± 1.39	0.15	0.59	0.02	0.007
Body weight (kg)	34.3 ± 10.75	37.99 ± 9.52	44.78 ± 12.32	0.001*	0.12	0.00	0.00	37.59 ± 10.04	39.96 ± 12.06	49.16 ± 14.18	0.02*	0.23	0.003	0.000
Energy of full day food (kcal/d)	1879.29 ± 275.49	1929.57 ± 298.81	1881.02 ± 262.29	0.586	0.39	0.35	0.97	1881.07 ± 290.72	1902.64 ± 272.67	1943.69 ± 237.69	0.49	0.65	0.58	0.39
Energy of school food (kcal)	787.02 ± 70.88	808.31 ± 108.51	827.89 ± 102.86	0.117	0.30	0.29	0.04	798.2 ± 91.08	809.44 ± 101.43	870.71 ± 102.96	0.10	0.51	0.02	0.005

[1]ANOVA test, pos hoc test between [2]groups 1 and 2, [3]groups 2 and 3, and [4]groups 1 and 3. *Significant at $p < 0.05$.

standard dietary target (1500 mg/d). These data are comparable to findings from other studies that revealed the same trends that daily Na intake is still high. A review of population study about salt intake around the world describes most populations including children have mean Na intakes higher than 100 mmol/d and these intakes increase with age [11]. Further analysis showed the Na content of the school food was 606.9 ± 218.9 mg/d. Although it contributed nearly one-third from daily Na intake, the intake exceeded maximum of 30% of school food recommendation (124.8%). The main food sources of Na intake in our study are sweet beverage (74.5%), biscuits (42.55%), crackers (35.5%), and breads (21.28%) (data not shown). These findings are similar with those of previous studies in children from Germany [35], US [37], and Australia [31].

To further understand about high Na intake concern in the school environment, we analyzed factors contributing the nutrient including the role of pocket money. Since food source rich in Na was categorized as unhealthy food and previous studies revealed pocket money is a risk factor for unhealthy eating [38, 39], this study found no association of pocket money with Na intake. The contradictory finding of this study can be explained by variety access to get food at
13 school. In our study, source of food consumption while at school is not only from pocket money, 69.7% of subjects also brought home-packed lunch and others joined at school meals, so the amount of pocket money not linier with food
14 consumption by subjects. This finding is supported by Li et al.'s [38] study that the association of pocket money with unhealthy food consumption was smaller in schools with restrictions on unhealthy food.

In contrast to Na intake, average daily K intake from urinary analysis in the present study was 16.39 ± 12.57 mmol/d equivalent to 639.15 ± 490.04 mg/d. Only 11.6% and 3.9% of the subjects consumed K intake higher than 1000 mg/d and 2000 mg/d, respectively. Consequently, our analysis indicates that almost all subjects had K intake lower than 1000 mg/d. Furthermore, based on adequate intake, that is, 4500 mg·K/day [1, 40], we did not find any pupils above this level of intake. It is important to note that all subjects had K intake lower than the Indonesian RDA for children aged 9–12 years. Moreover, it is somewhat surprising that urinary K in this study is the lowest than that among children in all previous studies. Other authors have reported higher K intakes than those in our study. A potassium intake of 46.6 ± 23.02 mg/d was reported in Lebanese subjects [21], Grimes et al. [31] in the SONIC study recorded 54 ± 2 mg/dl, and Oliveira et al. [40] reported an average of 43 mmol/d on 8% of children who met the WHO recommendation for K intake. Two previous studies implicated low K intake in schoolchildren; Kristbjornsdottir et al. [41] in a study of subjects with a mean age of 6 years in which a K intake of approximately
15 31 mmol/d equivalent to 1210 mg/d. Allison and Walker [42] reported a daily K intake of 1000 mg/d (25.64 mmol/d) in children aged 3–5 years. Based on the WHO suggestion that the recommended K intake is at least 3510 mg/d, our results showed only one subject who met the WHO recommendation for K intake. Moreover, K intake while at school in our study contributed nearly 30% of total daily intake. Thus, our study indicates that almost all children failed to meet the recommended daily K intake.

It is well known that major food sources of K are fruits and vegetables (FV). Really, it is not surprising that K intake in our study is of very low compliance since Indonesian people consume very low fruits and vegetables. This is confirmed by the fact from recent data of Indonesian National Health Survey 2018 that the lack of fruits and vegetables consumption among children more than 5 years increases from 93.5% at 2013 and becomes 95.5% at 2018 [43]. According to the data of Individual Food Consumption Survey 2014, the average consumption of fruits and vegetables of the Indonesian population was 108.8 g/d, which is much lower than that of the World Health Organization (400 g/d); those consumptions were only 81.9 g/d of children aged 5–12 years [44]. The previous studies revealed factors contributing to low fruit and vegetable consumption among children, such as preference, availability/access, and pocket money [45–47].

The preference of FV among students can be analyzed by observing plate waste of lunch meals. Based on observation of their packed lunch and school meals, vegetable is the major food waste, almost all children waste more than 75% of vegetables. The present findings, like those from several population studies, demonstrated that elementary school students wasted a significant amount of these foods; it might indicate that they did not like vegetable items in the menu [45, 46]. Furthermore, the children's preference for FV can be known from observing their home-packed lunch menus. The analysis of home-packed lunch in this study showed that only 4.6% and 15.7% of subjects brought fruits and vegetables, respectively, in the lunch box. Generally, the lunch box was prepared by mothers; however, we did not ask directly about preference of these foods from neither mother nor children, but it might be explained by the previous study that habitual intake of children was mostly influenced by parents' (mother's) food preference [47]. Another factor causing low intake of FV in this study is the limitedness of healthy food in canteen. Observing school canteen, we found that FV items in the menu were very limitedly available at the school canteen. This finding is similar to that of Gabriel et al.'s study that many canteens offered menus of low nutritional value and the items, which were least likely available, were fruits [48]. Related to pocket money, there is no association between pocket money and potassium intake, although we found that they spent their pocket money mostly for buying some sweets, beverages, biscuits, and breads since fruit and vegetable items in the menu were very limitedly available at the school canteen. Finally, in this finding, urinary Na and K correlated significantly ($r = 0.412$, $p < 0.001$), and both were associated with energy of school food and correlated with nutritional status (Table 5). Therefore, it is obvious to consider that the nutritional content of school food is very important since it can contribute to nutritional and health status among schoolchildren.

The limitation of this study is the dietary method used for assessing Na and K intake. Often, dietary Na and K were underestimated or overestimated [19]. Our study reported that potassium intake from recall data was much higher than that of urinary K excretion. Perhaps, these results could be explained by overestimated recorded dietary K because of the food waste and estimation method. It suggests the weakness of our study is that we estimated using household measures of school food rather than food-weighing methods. Conversely, sodium intake from recall data showed underestimation; it was lower than that of urinary Na excretion. A similar finding was also described in studies on Indonesian older women that Na intake from the dietary method was less than that in urine; on the other hand, K intake from the dietary method was greater than that in urine [27]. Another paucity of this study is that we applied spot urines rather than 24 h urinary excretion, although these methods have been validated and performed by a previous study [21].

To the best of our knowledge, this is the first study supplying data on urinary Na and K excretion in Indonesian schoolchildren. In Indonesia, urine has been previously used to assess these nutrients but limited on adults [27], and it has not been yet used especially in children. Focus on school food related to dietary Na and K is still rarely studied by other studies. By evaluating the Na and K component of school foods, we confirmed the importance of these nutrients on the population level particularly to meet nutrient-based standard among schoolchildren. Future research should examine the direct impact of these nutrients on adverse health effects of
16 children such as obesity and hypertension. Furthermore, more studies evaluating all factors that cause excessive Na and deficient K intakes among schoolchildren are needed to support the present findings. Finally, the most important thing is making comprehensive strategies to get healthy diet for children; hence, it is urgent to encourage environmental school setting to get the best way for improving the nutritional intake in schoolchildren by educating pupils, providing healthy school foods such as fruits and vegetables, and of course creating supporting policies.

5. Conclusion

In summary, the study reports that the Indonesian schoolchildren aged 9–12 years are categorized by excessive Na intake and very deficient K intake. Since school food has a great contribution to cause this condition, it is vital to encourage the environmental school setting to perform the best way for improving the nutritional intake, particularly Na and K intake among schoolchildren.

20 Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors confirm that there are no conflicts of interest.

Acknowledgments

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Composition Comments

1. Please note that extensive editing has been performed in the text. Hence, please check and confirm that your intended meaning is retained throughout the text.

2. We have rephrased the sentence “Excessive Na intake ... have been reported” for clarity. Please confirm that this is your intended meaning.

3. The sentence “Furthermore, Na and K ... nutritional school standard” is unclear. Please rephrase the sentence for clarity.

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6. We have rephrased the sentences “Sodium is mostly ... processed food” for clarity. Please confirm that this is your intended meaning.

7. Please rephrase the caption of Table 2 for clarity.

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13. The sentence “The contradictory finding ... food at school” is unclear. Please rephrase the sentence for clarity.

14. The part “so the amount of pocket ... subjects” is grammatically unclear. Please rephrase the part for clarity and correctness.

15. The sentence “Two previous studies ... to 1210 mg/d” is unclear. Please rephrase the sentence for clarity.

16. We have rephrased the sentence “Future research should ... obesity and hypertension” for clarity. Please confirm that this is your intended meaning.

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Comments for the author

Farapti et al. investigated urinary sodium and potassium excretions in the Indonesian schoolchildren aged 9-12 years. The 24-h sodium and potassium excretions were estimated using early morning urine samples. Dietary energy and macronutrient intakes were also evaluated by 2 x 24-h dietary recall. As a result, estimated urinary Na and K excretions were 105.42 mmol/day and 16.39 mmol/day, respectively. Na intake was generally high (41.7% of the subjects exceeded 2300 mg/day), whereas K intake was low (only 11.6% of the subjects exceeded 2000 mg/day). Na and K content of school food contributed 65% and 25% of the dairy intake of each nutrient. Based on these findings, the authors concluded that high Na and low K intakes are nutritional problems of the Indonesian school children.

This cross sectional study provides important information on the Na and K intakes of the Indonesian children. The study design seems sound and most of the results are reasonable.

This referee raises some concerns listed below that should be adequately addressed.

Reviewer comments	Author comments
Characteristics of the subjects with high Na or high Na/K ratio	In this manuscript, we concern in urinary Na and K without discussing about Na/K ratio, although the value is appear in the table. Furthermore, we have omitted urinary Na/K ratio in part aim of the study, in last sentence of introduction. Before: the study aimed at assessing and evaluating Na. K, and urinary Na/K ratio using.... After revision: the study aimed at assessing and evaluating urinary Na and K using ....
Reviewers asked information clearly about Na intake “A 41.3% of the subjects showed Na intake more than 2300 mg/day. The authors may provide the information on the characteristics of them. Na intake generally correlates with body weight and energy intake. Na intake is also known to associate with low socioeconomic status. The authors investigated pocket money of the subjects. If main sources of Na intake were beverage, biscuits, crackers and breads (page 7), Na intake would be positively associated with high pocket money. The	- Authors had added the information on characteristics on Na intake in table 5 about factors contributing of Na and K intake; it includes pocket money, body weight, energy intake. - Related to statistical analysis related information in table 5, authors had added “One-way ANOVA test and post hoc test were used to analyze factors contributing estimating Na and K intake” in the last sentence of statistical analysis section - Author had explained clearly and discussed the information in the fifth paragraph “ to further understand.............. unhealthy food.(page 8) and also added two references related to discussion (references no 41 and 42)

authors may discuss the relationship between pocket money (socioeconomic status) and Na intake or Na/K ratio.”	
Reviewers asked information about factors contributing K intake “K intake usually correlates with Na intake. It seems that K intake of the subjects was low independently of Na intake. What are the factors contributing K intake of the subjects? Was low K intake due to the availability of fruits/vegetables or just the preference of the children? Was there any association between pocket money and K intake?”	As same as with the Na revision - Authors had added the information on characteristics on Na intake in table 5 about factors contributing of Na and K intake; it include pocket money, body weight, energy intake. For question “the factors contributing K intake of the subjects in this study” Author had explained clearly and discussed the information in the fifth paragraph 8 (page 9) The preference of..........canteen school At the discussion, author had added one reference in the discussion (reference no51)
Grammatical errors are often found. English should be rewritten.	Authors had corrected many grammatical errors or unclear sentences throughout the manuscript There are the correction: **Abstrak**: observasing----- observing Is chategorized: are categorized Correct the sentence: Na and K content of school food were 65% and 25% contributed in daily intake Na and K respectively ------- Na and K content of school food were 33% and 29% contribute of the daily intakes each nutrient, and contributed 125% and 25% respectively compare to nutritional school standard. **Results** Revision at table 1: delete % in the content, percentage (%) was written only in sub title (in the highest row) There is a reverse placement about 2000 and 1000 Before: For estimated K intake, only 11.6 % and 3.9% of the subjects consumed K intake higher than 2000 mg/d and 1000 mg/d respectively (table 3) After revision: only 11.6 % and 3.9% of the subjects consumed K intake higher than 1000 mg/d and 2000 mg/d respectively (table 3).

	Discussion Contibuted ---contributed Limitted ---limited Childen --- children Apllied --- applied **Conflicts of interest** Has no no conflicts of (double “no”)-----has no conflicts