

## ORIGINAL ARTICLE

# Prevalence and Factors Associated With Personal Hygiene Practice Among Students at Boarding School in Indonesia

Wiwik Eko PERTIWI, Titin NASIATIN

Department of Public Health, Universitas Faletehan, Banten, 42161 Indonesia

## ABSTRACT

**Introduction:** Many diseases linked to poor personal hygiene are infectious skin, respiratory, and digestive diseases. Personal hygiene behavior is influenced by a variety of factors, including the parents' education and occupation, the influence of peers, and the availability of information and facilities. This study aimed to determine the prevalence and factors associated with personal hygiene practice among students at boarding school in Indonesia. **Methods:** A cross-sectional design was used in this study to examine students aged 15 to 19 who attended Indonesian secondary boarding schools. Multivariable logistic regression was used to assess each sociodemographic and other factor relationship to personal hygiene. **Results:** The total sample size was 300 students between the ages of 15 and 19. Overall, 30% of children reported having suboptimal oral hygiene, 40% reported hand washing before eating, 19% reported hand washing after using the toilet, 11% reported taking a bath, and 28% reported using soap when washing. Numerous risk factors for suboptimal hygiene behavior were identified, including low socioeconomic status, health risk behaviors, and a lack of protective factors. **Conclusion:** Personal hygiene was found to be less than optimal among boarding school students. These findings emphasize the importance of enhancing the effectiveness of current personal hygiene health promotion programs by taking sociodemographic characteristics into account.

**Keywords:** Personal hygiene, Adolescent, Boarding school

## Corresponding Author:

Wiwik Eko Pertiwi, SKM., MKM  
 Email: [wiek.ep@gmail.com](mailto:wiek.ep@gmail.com)  
 Tel: +6287771167746

## INTRODUCTION

Hygiene is critical in daily life, including the cleanliness of one's home, food and beverages, the surrounding environment, and the workplace environment, as well as personal hygiene. Personal hygiene is the way humans care for themselves in order to stay healthy. Personal hygiene encompasses efforts to maintain healthy skin, nails, oral and dental hygiene, eyes, nose, ears, feet, hair, and genital hygiene, as well as the cleanliness of the clothing worn (1). Personal hygiene is necessary to promote self-esteem and security, to improve one's health status, and to maintain physical and psychological health (2).

Many diseases linked to poor personal hygiene are infectious skin, respiratory, and digestive diseases. The disease is widespread in the community, especially in

low-income and dirty neighborhoods (1). The disease is also found in places where people interact frequently, like dormitories or boarding schools (3). Borrowing items like clothing, bath soap, towels, and combs can lead to an increase in the spread of infectious diseases (3). Infections of the respiratory tract, anemia, skin diseases, intestinal worms, and diarrhea can all occur as a result of boarding school students not practicing good personal hygiene (4). As many as 24.25% of elementary school students in India in 2012 were found to have skin infections and poor hygiene, with the majority occurring in girls (39.5%) and boys (14.8%), with the most common disease being scabies (21.7%), followed by pityriasis (19.6%). Pediculosis was found to be 18.5%, and tinea infection was 16.5% (3).

Personal hygiene behavior is influenced by a variety of factors, including the parents' education and occupation, the influence of peers, and the availability of information and facilities. An earlier study discovered that 42% of students in Islamic board schools practiced personal hygiene, which was lower than the 58% in the unfavorable category, and

that knowledge and provision of information about personal hygiene were associated (5). To maintain good health, it is critical to have a basic understanding of personal hygiene (6). According to previous research, menstruation and reproductive health knowledge have a significant impact on menstrual hygiene (7–9) discovered a correlation between respondents' knowledge of flour albus and its occurrence. According to Rofifah and Utomo's research, students' attitudes toward preventing scabies are influenced by their knowledge (10).

Sources of information are critical in determining an individual's attitudes and actions. This is consistent with research by (5), which indicates that personal hygiene behavior is more or less prevalent in students who lack information/socialization about personal hygiene (69.2%), compared to students who receive information/socialization about personal hygiene (46.9%). Good personal hygiene behavior was more prevalent in boarding school students, with 53.13% receiving information/ socialization about good personal hygiene, than in the public school student group, with less than 30.8% receiving information/ socialization about personal hygiene. Additionally, the study found a significant correlation between the provision of information/socialization about personal hygiene and the personal hygiene behaviors of students attending Islamic Boarding Schools in Indonesia (4).

Peer groups are another factor that influences personal hygiene behavior. Peers have a significant influence on adolescents' attitudes, interests, appearance, and behavior. This is because peer communication is easier to digest and accept than communication with parents or other adults (11,12). In Islamic boarding schools, there is a strong correlation between peer support and students' personal hygiene behaviors. According to (12), peer communication is associated with a respondent's personal hygiene during menstruation. Additionally, other research indicates that the role of friends is associated with students' healthy behavior (12). According to (5) research on the availability of personal hygiene facilities and infrastructure in Islamic boarding schools, there are a number of issues that need to be addressed, including the fact that 86.3% of respondents stated that there are no irons in Islamic boarding schools, 82.6% stated that each student does not have a separate bed, and 76.1% stated that there is no separate bathroom for every student. About 44.7% has enough towels to use after wash their hands with soap. According to the study, there is a direct correlation between the availability of facilities and infrastructure and the students' personal hygiene habits (10). Thus, this study aimed

to determine the prevalence and factors associated with personal hygiene practice among students at boarding school in Indonesia.

## MATERIALS AND METHODS

### Study design

A cross-sectional design was used in this study to examine students aged 15 to 19 who attended Indonesian secondary boarding schools. To gather data, a stratified sampling design was employed in two stages. Selecting boarding schools and each of the schools was chosen at random from a pool of applicants with a probability proportional to its student body size.

### Sample

Secondary school boarders in the Indonesian province of Banten were the focus of the survey. To calculate the necessary sample size for a prevalence estimate, we used a standard proportion formula. The sample size was determined by utilizing the standard deviation of the proportion as the dependent variable, with a margin of error (e) between 0.01% and 0.05% and a 95% confidence interval. After accounting for a 10% non-response rate, it was decided that a sample size of 250 students would be sufficient. During the time of data collection, we were able to successfully recruit 300 students.

### Measure

Five questions were used to assess participants' attention to personal cleanliness. The first inquiry was on the respondent's oral hygiene routine over the previous 30 days, namely how often they brushed their teeth. (Here are the choices for answers: No more than once every 30 days; once a day; twice a day; three times a day; and three times a day are the ranges for how often you clean and wash your teeth. The last three questions all had to do with how often respondents had washed their hands before eating in the previous 30 days. ...just after using the restroom (or latrine)? "In the past 30 days, how often have you taken a shower?" how often did you use soap to wash your hands? (The possible answers went from 0 (never) to 5 (always) (always) (13).

One question used to assess eating habits inquired, "How many times per day, on average, did you eat fruits in the last 30 days?" (response options varied from "1" for "I did not eat fruits in the last 30 days" to "3" for "I ate fruits once per day" (I ate fruits five or more times per day). Vegetables: "How often, on average, did you eat vegetables over the last 30 days, including "country-specific examples"? (Response options ranged from 1 (I did not eat vegetables in the last 30 days) to 2 (I ate vegetables less than once

per day), 3 (I ate vegetables once per day), and 7 (I ate vegetables five or more times per day)) (13). Low fruit (or vegetable) consumption was defined as less than once per day, therefore students who reported consuming them less than once per day were flagged as having insufficient consumption patterns. How many days in the last 30 have you smoked cigarettes? (From 0 (no days) to 7 (all 30 days), 1 was the least frequent answer.) (13) "In the last 30 days, on what percentage of days did you drink alcohol?" (The possible answers ran from "no days" (7) to "all 30 days" (1).)(13).

The level of physical activity engaged in during one's free time was gauged by asking the following: "What kinds of activities do you engage in that raise your heart rate and make you breathless at times?" Playing a sport, hanging out with friends, or even just walking to class are all great ways to get some exercise. Exercising can take the form of anything from a brisk walk to a full-on sprint, from dancing to football. Don't count gym or PE class, but answer this: "On how many days in the recent week did you engage in physical activity lasting at least 60 minutes?" how many days throughout a regular or average week do you engage in physical activity for at least 60 minutes per day? (13)".

Protective factors were measured using five questions assessing school peer support, parental or guardian monitoring, connectivity, and bonding. How often do you feel like the majority of kids at your school were helpful and nice during the last 30 days? The level of friendship and support among students was evaluated this way. In the last 30 days, how often have your parents or guardians checked to see if you've finished your homework? The question relates to communication with parents or guardians and asks, "During the last 30 days, how often did your parents or guardians understand your issues or worries?" Parental knowledge was measured by asking, "During the past 30 days, how often did your parents or guardians genuinely know what you were doing with your leisure time?" All the way from never (1 response) to always (5 answer) was thirteen (13) for these questions. Three levels (low, medium, and high) were assigned to the sums of the five protective factor items.

### Data collection

An affiliated university's institutional review board approved this study. For the survey, permission was granted by the appropriate kesbangpol and district offices, as well as selected schools. The survey consent form was distributed to parents a week before it was given to teachers, and they all received training on it. Eligible respondents also provided their own consent on the day of the survey along with parental permission. Individuals were disqualified if they had

not obtained the informed consent of their parents or had voluntarily withdrew from the study. For the pilot study, guidelines for research logistics, data collection, and any questionnaire modifications that may be required were set forth. The data collection period spanned from March to June of 2021. It took a week of training for the data collectors before they could begin collecting data.

### Data analysis

Information was analyzed with IBM SPSS for Windows version 21. For this investigation, we employed a sophisticated sampling strategy with a confidence interval of 95%. (CIs). Nonresponse and selection probabilities were modified using weighting variables. Using descriptive bivariate analysis, we were able to calculate the percentage of people who take care of their own hygiene. Each social and demographic factor's association with grooming habits was evaluated using multivariate logistic regression. The Hosmer-Lemeshow goodness-of-fit test was used to evaluate the model's fitness ( $P > 0.05$ ). Using a significance level of  $p < 0.05$ , we estimated the prevalence and the aORs with 95% CIs.

### RESULTS

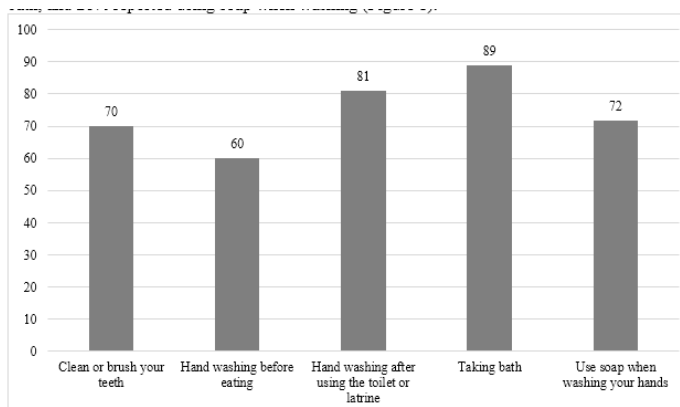
The total sample size was 300 students between the ages of 15 and 19. Males made up 52.7% of school children, while females made up 47.3%. Around 81.3% have access to information, 79.3 percent have health insurance, and 97.7% have a working father (Table I).

Overall, 30% of children reported having suboptimal oral hygiene, 40% reported hand washing before eating, 19% reported hand washing after using the toilet, 11% reported taking a bath, and 28% reported using soap when washing (Figure 1).

Male gender (odds ratio: 2.02, 1.02, 3.45), information exposure (odds ratio: 1.29, 1.04, 2.73), health risk behaviors (fewer than daily fruits: odds ratio: 1.25, 1.82–2.78), and a lack of protective factors (odds ratio: 2.30, 1.13, 7.29) were all associated with suboptimal tooth brushing in multivariate analysis. Exposure to information (odds ratio: 2.35, 1.17, 3.08), risky health behaviors (fewer than daily fruits: odds ratio: 1.68, 1.27–2.24), and a lack of protective factors (odds ratio: 2.11, 1.72–2.59) were all associated with suboptimal hand washing before eating. Additionally, male gender (odds ratio: 2.14, 1.18, 4.15), information exposure (odds ratio: 1.28, 1.05, 4.58), health risk behaviors (smoking: odds ratio: 1.21, 1.07–1.38) (less than daily fruits: odds ratio: 1.77, 1.46–2.14), and a lack of protective factors (odds ratio: 2.14, 1.05, 4.53) were found to be associated with suboptimal hand washing after toileting. Exposure to information (odds ratio: 2.57, 1.13, 3.56), health risk behaviors (alcohol use: odds ratio: 1.52, 1.33–1.72, less than daily fruits: odds ratio: 1.43, 1.22–1.68), and

**Table I : Demographic characteristics (N=300)**

Variabel	N (%) or Mean (SD)
Age (years)	16.78 (1.34)
Gender	
Male	158 (52.7)
Female	142 (47.3)
Mother’s education	
Below senior high school	201 (67)
Above senior high school	99 (33)
Father’s education	
Below senior high school	154 (51.3)
Above senior high school	146 (48.7)
Father’s working status	
Employed	290 (97.7)
Unemployed	10 (3.3)
Has health insurance	
No	62 (20.7)
Yes	238 (79.3)
Exposure to informationn	
No	56 (18,7)
Yes	244 (81.3)



**Figure 1 : Prevalence of personal hygiene practice (often or always) among student in boarding school.**

a lack of protective factors (odds ratio: 1.38, 1.16–1.65) all had a significant effect on bathing. Additionally, using soap to wash your hands was associated with exposure to information (odds ratio: 3.15, 1.39, 4 and 5.78), health risk behaviors (alcohol use: odds ratio: 1.59, 1.41–1.79, less than daily vegetable consumption: odds ratio: 1.59, 1.37–1.83), and a lack of protective factors (odds ratio: 1.72, 1.36–2.19) (Table II).

**DISCUSSION**

Findings from various locations, including nine African countries (22.7%) and numerous Pacific Island states (22-38%) are congruent with those from Indonesia, where over 25.6% of boarding school children were found to have sub-optimal personal hygiene (14,15). Forty-five percent of people polled admitted they have a problem with their hand-washing routine, with only 19 percent doing it properly after using the restroom and 28 percent doing so improperly after using soap. Thirty-eight percent of people don’t always wash their hands before eating, forty-one percent don’t always wash their hands with soap after using a latrine or restroom, and sixty-five percent don’t always wash their hands with soap in nine African countries (14); in the Pacific Island states, thirty-five percent to three-and-a-half percent of people don’t always wash their hands before eating (15).

This study also found that males were more likely to have sub-optimal personal hygiene than females, which was similar to previous studies (14,16,17). It was found that lower socioeconomic status was not associated with poor personal hygiene (15,16,18–22). Furthermore, the lack of protective factors and health risk behaviors (e.g., less than daily fruit and veg consumption) were linked to poor personal hygiene, as has been found in other studies (14,23–25). Substance abuse, inadequate consumption of fruits and vegetables, and insufficient physical activity were all linked to poor personal hygiene in this study, which is in line with previous findings (14,15). Socio-demographic factors, gender and education influence hygiene behaviors in adolescents through their impact on the sense of coherence and peer social networks, explains the model proposed by Dorri and colleagues (p. 266) as a possible explanation for the link between oral hygiene and other aspects of health, including socioeconomic status. In order to lower the occurrence of prevalent infectious diseases in Indonesia, it is important to stress personal hygiene. To best promote healthy behaviors and boost protective variables, interventions should target the most relevant risk factors or mediators of health-related behaviors.

This study had a number of limitations. To begin, the study enrolls only adolescents of school age. School-aged adolescents may not be representative of all adolescents in a country, as the prevalence of suboptimal

**Table II : Factors associated with personal hygiene (N=300)**

Variable	Clean or brush your teeth, aOR (95% CI)	Hand washing before eating, aOR (95% CI)	Hand washing after using the toilet or latrine, aOR (95% CI)	Taking bath, aOR (95% CI)	Use soap when washing your hands, aOR (95% CI)
Gender					
Male	1	1	1	1	1
Female	2.02** (1.02, 3.45)	1.02 (0.56, 1.14)	2.14** (1.18, 4.15)	1.8 (0.54, 1.36)	1.55 (0.72, 3.41)
Mother's education					
Below senior high school	1	1	1	1	1
Above senior high school	0.62 (0.41, 1.07)	0.72 (0.48, 1.50)	0.67 (0.54, 1.18)	0.29 (0.06, 1.23)	1.25 (0.38, 1.67)
Father's education					
Below senior high school	1	1	1	1	1
Above senior high school	0.58 (0.24, 1.65)	1.13 (0.56, 2.70)	1.3 (0.7, 2.3)	1.0 (0.6, 1.6)	1.1 (0.7, 1.8)
Father's working status					
Employed	1.14 (0.27, 1.89)	0.57 (0.14, 1.92)	0.73 (0.24, 1.91)	0.35 (0.13, 1.15)	0.55 (0.17, 1.90)
Unemployed	1	1	1	1	1
Has health insurance					
No	1	1	1	1	1
Yes	0.81 (0.23, 1.88)	0.79 (0.34, 2.50)	0.68 (0.33, 1.67)	0.82 (0.31, 1.97)	0.77 (0.43, 1.79)
Exposure to informationn					
No	1	1	1	1	1
Yes	1.29* (1.04, 2.73)	2.35** (1.17, 3.08)	1.28** (1.05, 4.58)	2.57** (1.13, 3.56)	3.15** (1.39.4, 5.78)
Substance use					
Current alcohol use	1.31 (0.68, 1.75)	1.25 (0.28, 1.90)	1.03 (0.7, 1.6)	1.52* (1.33–1.72)	1.59** (1.41–1.79)
Current smoking	1.15 (0.27, 1.77)	1.72 (0.32, 1.85)	1.21* (1.07–1.38)	1.27 (0.95–1.70)	0.4 (0.2, 0.8)
Fruits less than once daily	1.25** (1.82–2.78)	1.68** (1.27–2.24)	1.77** (1.46–2.14)	1.33 (0.93–1.88)	1.20 (0.99–1.46)
Vegetables less than once daily	1.15 (0.27, 1.65)	1.30 (0.17, 1.45)	0.84 (0.76, 1.62)	0.57 (0.63, 1.76)	1.59* (1.37–1.83)
Physical activity					
<60 min daily (at 5 or more days a week)	0.42 (0.11, 2.35)	0.64 (0.13, 2.72)	0.58 (0.14, 3.70)	1.43* (1.22–1.68)	1.16 (0.95–1.41)
Sedentary behaviour	1	1	1	1	1
Lack of protective factor					
Low	1	1	1	1	1
Medium	2.30** (1.13, 7.29)	1.49 (0.9, 3.29)	2.14** (1.05, 4.53)	1.38** (1.16–1.65)	1.72** (1.36–2.19)
High	1.57** (1.38–1.79)	2.11** (1.72–2.59)	0.96 (0.80–1.14)	1.39** (1.06–1.82)	1.16 (0.95–1.41)

aOR = adjusted odds ratio. \* = significant at P-value < 0.05; \*\* = significant at P-value < 0.05, but CI includes the null value which is because of the rounding effect; 1 = reference category.



personal hygiene varies between the two groups. Given that the questionnaire was self-completed, it is possible that some study participants over-reported hygiene behavior, either intentionally or inadvertently, as has been observed in other studies (26). This effect may have been mitigated by the fact that study participants completed questionnaires anonymously. Furthermore, the assessment of risk factors associated with hygiene behavior was limited, and additional risk factors could have been included (27–30). Finally, due to the cross-sectional nature of the data collection, we are unable to attribute causality to any of the study's associated factors.

## CONCLUSION

In conclusion, personal hygiene was found to be less than optimal among boarding school students. Numerous risk factors for suboptimal hygiene behavior were identified, initiatives targeted at enhancing the hygienic practices of this demographic of adolescents should take into account the unique challenges they face, such as poor socioeconomic position, health risk behaviors, and a dearth of protective factors.

Adolescents must be encouraged and empowered to take personal hygiene responsibility. Additionally, these findings emphasize the importance of enhancing the effectiveness of current personal hygiene health promotion programs by taking sociodemographic characteristics into account.

## ACKNOWLEDGEMENT

Thanks to participants to join in this study.

## REFERENCES

1. Kartikasari A, Fatimawati I. Differences in Personal Hygiene for Pondok Adolescent Students and Returning Homes at Madrasah Aliyah Hasan Munadi, Banggle Beji Village, Pasuruan in 2015. *Medica Majapahit (JURNAL Ilmu Kesehatan Sekolah TINGGI ILMU Kesehatan MAJAPAHIT)*. 2015;7(2).
2. Potter PA & AGP. *Nursing Fundamentals*. 7th ed. Jakarta: Salemba Medika; 2009.
3. Syukri S. Description of the knowledge and behavior of students regarding personal hygiene and residence at Islamic boarding school X in Bogor district. UIN Syarif Hidayatullah Jakarta: Fakultas Kedokteran dan Ilmu Kesehatan, 2017; 2017.
4. Nurulicha SPDKW. Differences in knowledge, attitudes, sources of information and other factors on personal hygiene during menstruation. *J Kesehatan Dan Kebidanan (Journal Heal Midwifery)*. 2019;8(1):1–13.
5. Zakiudin A, Shaluhayah Z. The personal hygiene behavior of students in Islamic boarding schools in the Brebes Regency will be realized if it is supported by the availability of infrastructure. *J Promosi Kesehat Indones*. 2016;11(2):64–83.
6. Firdaus H, Astutik E. DESCRIPTION OF KNOWLEDGE ATTITUDE AND BEHAVIOR OF PERSONAL HYGIENE ORGANS OF EXTERNAL GENITAL ORGANS IN CLASS VII AND VIII OF AL-IRSYAD AL-ISLAMIYAH SMP IN 2017 BANYUWANGI.
7. Andri SW, Candra PA, Suarilah I. FACTORS RELATED TO PERSONAL HYGIENE DURING MENSTRUATION. *J Kesehat Manarang*. 2018;4(2):104–13.
8. Kursani E, Marlina H, Olfa K. Factors Affecting the Occurrence of Flour Albus (Whiteness) in Young Women at SMA PGRI Pekanbaru in 2013. *J Marteniti Neonatal*. 2015;3(2):30–5.
9. Komalasari T. Factors related to personal hygiene behavior of class VII-VIII students during menarche at SMPN 2 Majalengka in 2015. *J Keperawatan dan Kesehat Med AKPER YPIB Majalengka, II (3)* Retrieved from <http://ejournal.akperypib.ac.id/index.php/tag/perilaku-personal-hygiene>. 2016;
10. Rofifah TN, Lagiono L, Utomo B. The Relationship between Dormitory Sanitation and Personal Hygiene Santri with Scabies Incidence at Al Ikhsan Islamic Boarding School Beji Village, Kedungbanteng District, Banyumas Regency in 2018. *Bul Keslingmas*. 2019;38(1):102–10.
11. Desmita PP. Bandung. *Remaja Rosdakarya*. 2006;
12. Bujawati E, Raodhah S, Indriyanti I. Factors related to personal hygiene during menstruation in female students at the Babul Khaer Islamic Boarding School, Bulukumba Regency, South Sulawesi Province in 2016. *Hig J Kesehat Lingkungan*. 2017;3(1):1–9.
13. CDC. *Global School-based Health Survey (GSHS)*. 2020.
14. Pengpid S, Peltzer K. Hygiene behaviour and associated factors among in-school adolescents in nine African countries. *Int J Behav Med*. 2011;18(2):150–9.
15. Tran D, Phongsavan P, Bauman AE, Havea D, Galea G. Hygiene behaviour of adolescents in the Pacific: associations with socio-demographic, health behaviour and school environment. *Asia Pacific J Public Heal*. 2006;18(2):3–11.
16. Maes L, Maser M, Honkala S. Oral health. Young people's Heal Context Heal Behav Sch Child study *Int Rep from*. 2001;2002:130–2.
17. Siziya S, Muula AS, Rudatsikira E. Self-reported poor oral hygiene among in-school adolescents in Zambia. *BMC Res Notes*. 2011;4(1):1–4.
18. Kumar S, Panwar J, Vyas A, Sharma J, Goutham B, Duraiswamy P, et al. Tooth cleaning frequency in relation to socio-demographic variables and personal hygiene measures among school

- children of Udaipur district, India. *Int J Dent Hyg.* 2011;9(1):3–8.
19. Maes L, Vereecken C, Vanobbergen J, Honkala S. Tooth brushing and social characteristics of families in 32 countries. *Int Dent J.* 2006;56(3):159–67.
  20. Nzioka BM, Nyaga JK, Wagaiyu EG. The relationship between tooth brushing frequency and personal hygiene habits in teenagers. *East Afr Med J.* 1993;70(7):445–8.
  21. Taani DS, Al-Wahadni AM, Al-Omari M. The effect of frequency of toothbrushing on oral health of 14-16 year olds. *J Ir Dent Assoc.* 2003;49(1):15–20.
  22. Park Y-D, Patton LL, Kim H-Y. Clustering of oral and general health risk behaviors in Korean adolescents: a national representative sample. *J Adolesc Heal.* 2010;47(3):277–81.
  23. Zaborski A, Milciuviene S, Bendoraitiene E, Zaborskyte A. Oral health behaviour of adolescents: A comparative study in 35 countries. *Stomatologija.* 2004;6(2):44–50.
  24. Ma X. Assessing school effects on dental hygiene and nutrition behaviors of Canadian adolescents. *Educ Rev.* 2007;59(1):37–54.
  25. Honkala S, Honkala E, Al-Sahli N. Do life-or school-satisfaction and self-esteem indicators explain the oral hygiene habits of schoolchildren? *Community Dent Oral Epidemiol.* 2007;35(5):337–47.
  26. Manun'Ebo M, Cousens S, Haggerty P, Kalengaie M, Ashworth A, Kirkwood B. Measuring hygiene practices: a comparison of questionnaires with direct observations in rural Zaire. *Trop Med Int Heal.* 1997;2(11):1015–21.
  27. Setyautamii T, Sermisri S, Chompikul J. Proper hand washing practices among elementary school students in Selat sub-district, Indonesia. *J Public Heal Dev.* 2012;10(2):3–20.
  28. Luby SP, Halder AK. Associations among handwashing indicators, wealth, and symptoms of childhood respiratory illness in urban Bangladesh. *Trop Med Int Heal.* 2008;13(6):835–44.
  29. Yalçın SS, Yalçın S, Altın S. Hand washing and adolescents. A study from seven schools in Konya, Turkey. *Int J Adolesc Med Health.* 2004;16(4):371–6.
  30. Curtis VA, Danquah LO, Aunger R V. Planned, motivated and habitual hygiene behaviour: an eleven country review. *Health Educ Res.* 2009;24(4):655–73.