

## Regional disparity in hygienic behaviors of Iranian children and adolescents: The CASPIAN-IV study

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### Abstract

**Background:** This study aimed to assess the pattern of hygienic behaviors of Iranian children and adolescents at national and sub-national levels according to the socioeconomic status (SES) of their living region.

**Methods:** Data were obtained from the fourth national school-based surveillance survey entitled, "CASPIAN-IV study" (2011-2012). It was conducted among 14,880 students, aged 6-18 years, who were selected by multi-stage random cluster sampling from 30 provinces in Iran. We used the World Health Organization Global School-based Student Health Survey (WHO- GSHS) questionnaire. Data were analyzed at national and sub-national levels according to the SES of the living region.

**Results:** Overall, 13,486 students (49.2% girls) with the mean (SD) age of 12.50 (3.36) years participated in this study (participation rate: 90.6%). At the national level, 67.21% of the participants had daily tooth brushing, the frequencies for always washing hands after using the toilet, washing hands before eating, and washing hands with soap in school were 85.61%, 56.53%, and 50.32%, respectively.

The frequency of daily tooth brushing had no significant difference according to the SES of the living region. In all of the categories of washing hands, the West region (second high SES rank) had the highest frequency of hygienic behaviors ( $p < 0.001$ ).

**Conclusion:** In general, the reported hygienic behaviors were at an acceptable level; however, a large comprehensive health-promoting plan should be considered for all children and adolescents at the national and sub-national levels taking into account the disparities according to their SES.

**Keywords:** Hygienic Behaviors, Tooth Brushing, Hand Washing, Children and Adolescents, Iran.

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### Introduction

Infectious diseases are still of great concern in developing countries. About 31% of

all deaths in southeast Asia are due to infectious diseases while the corresponding figure in Europe is only 5% (1). Despite the

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significant improvements in general health, still sanitation and personal hygienic conditions in past decades, which are a notable part of morbidity, mortality and disability adjusted life years lost (DALYs), are attributed to infectious diseases (2,3). Acute respiratory infection and diarrhea play a major role in causing mortality among children. Such diseases are mostly transmitted airborne or through person to person contacts in an environment with poor hygienic status (1). Some previous studies showed a relationship between contaminated food and water with over than 70% of all cases of diarrhea (4,5).

Hands are transporters for many viral and bacterial pathogens, which have been identified in previous studies (6,7). Fecal-oral route in transmission of diseases is often implicated after hand contacts with fomites without providing adequate hygienic cleansing and then contamination of objects, water or even food and consequently transmission of diseases to other individuals (8). Promotion of personal sanitation and hygienic behaviors, in addition to the benefit of healthy environment including healthy water, are attributed to well-being and less illness in children (9).

Hand washing with soap, as a cost-benefit hygienic habit, is shown to prevent child diarrheas and respiratory infections by 30-47% and 23%, alternatively (2,8,10). It is well documented that clean hands can decrease the burden of diseases (11). Gastrointestinal and respiratory symptoms have been less reported among children with hand washing behaviors (12). Although some children may practice proper hand washing behavior in their lives (13), this habit is not prevalent worldwide among children or even adults. It has been reported that the rates of hand washing with soap range from 0-34% globally(14). Hands are washed only in 5-15% of critical times such as after using toilet (1). A cross-sectional study among mothers of Nigerian children aged under 5 years showed that 41.6% of the mothers usually washed their hands with soap and water in a container, 19.5%

washed with soap and running water and the others used water without soap (15).

For children, schools are important places for learning and practicing healthy behaviors. The importance of oral health has also been emphasized for general health (16,17). Around 60-90% of school children suffer from dental caries worldwide according to World Health Organization (WHO) report(18). Decayed teeth and poor oral health can lead to toothache, missed school hours, difficulty in eating, sleeping, playing and brushing teeth (19,20). Many of the teeth problems are preventable by following an appropriate oral health care program such as regular tooth brushing, using fluoride toothpaste, and limiting consumption of carbonated drinks and sugary foods, (16,21). Tooth brushing is considered a significant way to remove dental plaques and preventing periodontal diseases (22). However, the frequency of tooth brushing has large variations in different nations (23).

This study aimed to compare the pattern of some hygienic habits and their relative frequencies in a nationally representative sample of Iranian children and adolescents according to the socioeconomic status (SES) of their living region.

## Methods

This study was conducted based on the extracted data from the fourth survey of a nationwide school-based surveillance program, entitled the Childhood and Adolescence Surveillance and Prevention of Adult Non-communicable Diseases (CASPIAN-IV) Study.

In 2011-2012, this comprehensive national study was conducted in urban and rural areas of 30 provinces in Iran. The methodology and executive details of the study have been published previously (24). In brief, schools were selected by multistage random cluster sampling method. Stratification was executed in each province according to the residence area (urban/rural) and school grade (elementary/ intermediate/high school). The sampling was propor-

tional to size with equal frequency in boys and girls. The sample size was calculated as 14,880 (48 clusters of 10 students in each province).

Considering the previously defined criteria of the combination of geography and socioeconomic status (SES), using principal component analysis, the country was classified into four sub-national regions. The Central region had the highest SES, followed by the Western, North-Northeast, and the Southeast regions (25).

We used the questionnaire of the WHO-Global School-based Student Health Survey (WHO-GSHS), which was validated after being translated into Farsi (26).

Data were collected on demographic characteristics, students' educational level, patterns of hygienic behaviors including tooth brushing and washing hands (after using the toilet, before eating, and with soap in school).

For tooth brushing, we categorized the general characteristics of the participants under the categories of self-reported frequency of tooth brushing including more than once a day, once a day, once a week, rarely and never (27, 28). The two first categories were considered as daily tooth brushing behaviors and other options as non-daily tooth brushing behaviors. For hand washing, the response options were categorized as dichotomous status of always and other (seldom/never).

### Ethical Concerns

After explaining the study aims and pro-

ocols, written and verbal consent were obtained from the students and one of their parents. Participation in the study was voluntary. Ethical approval was obtained from the relevant regulatory organizations.

### Statistical Analysis

Data were analyzed using survey data analysis methods in the STATA Corp. 2011 (Stata Statistical Software: Release 12. College Station, TX: Stata Corp LP. Package). All analyses were performed at national, regional and provincial levels by survey data analysis method using Chi-square test. We reported the frequency of hygienic behaviors with 95% confidence interval (95% CI).  $P < 0.05$  was considered as statistically significant.

### Results

Participation rate was 90.6%; the participants were 13,486 students (50.8% boys, 75.6% urban residents) with a mean (SD) age of 12.50 (3.36) years. The geographical distribution of participants from Southeast (lowest SES), North-Northeast (second low SES rank), West (second high SES rank) and Central (highest SES) regions were 1,181 (8.76%), 2,359 (17.49%), 6,119 (45.37%) and 3,827 (28.38%), respectively.

Table 1 demonstrates the frequency of studied hygienic behaviors at national and regional levels by gender and living area.

At the national level, 67.21% of the participants had daily tooth brushing, always washing hands after using the toilet, washing hands before eating and washing hands

Table 1. Frequency of Tooth Brushing and Washing Hands after using the Toilet at the National and Regional Level by Gender and Living Area: The CASPIAN-IV Study

	Southeast (Lowest SES)	North-Northeast (Second low SES)	West (Second high SES)	Central (Highest SES)	National	p
Daily tooth brushing % (95%CI)						
Boys (n=533)	292(53.19)	759 (63.89)	1787(58.21)	1132(56.49)	3970(58.29)	0.008
Girls(n=611)	471(74.88)	912(78.02)	2272(75.86)	1391(76.81)	5046(76.41)	0.682
Urban (n=633)	452(69.75)	1260(73.64)	3173(69.49)	2161(67.05)	7046(69.43)	0.023
Rural(n=511)	311(58.68)	411(63.62)	886(59.11)	362(61.15)	1970(60.3)	0.578
Total(n=1144)	763(64.77)	1671(70.9)	4059(66.92)	2523(66.13)	9016(67.21)	0.040
Always washing hands after using the toilet						
Boys (n=1184)	409(74.5)	991(83.49)	2575(84.21)	1704(85.2)	5679(83.59)	0.004
Girls(n=1167)	520(82.67)	999(85.68)	2685(89.86)	1565(87.19)	5769(87.7)	0.004
Urban(n=1707)	559(86.13)	1453(85.12)	4057(89.16)	2770(86.4)	8839(87.41)	0.013
Rural(n=644)	370(69.94)	537(83.13)	1203(80.41)	499(84.72)	2609(80.03)	0.004
Total(n=2351)	929(78.86)	1990(84.57)	5260(87)	3269(86.14)	11448(85.61)	<0.001

Table 1. Cntd

Always washing hands before eating						
Boys (n=3046)	320(58.29)	595(50.08)	1814(59.48)	1055(52.7)	3784(55.74)	<0.001
Girls(n=2979)	385(61.21)	564(48.21)	1874(62.49)	968(53.39)	3791(57.34)	<0.001
Urban(n=4528)	421(64.97)	798(46.64)	2748(60.44)	1653(51.29)	5620(55.48)	<0.001
Rural(n=1497)	284(53.58)	361(55.8)	940(62.58)	370(62.5)	1955(59.77)	0.104
Total(n=6025)	705(59.85)	1159(49.15)	3688(60.97)	2023(53.03)	7575(56.53)	<0.001
Always washing hands with soap in school						
Boys (n=1996)	290(52.92)	515(43.31)	1600(52.27)	915(45.66)	3320(48.81)	0.003
Girls(n=1806)	334(53.1)	547(46.75)	1715(57.19)	832(45.94)	3428(51.87)	<0.001
Urban(n=3208)	384(59.26)	736(42.99)	2467(54.1)	1450(44.99)	5037(49.66)	<0.001
Rural(n=594)	240(45.37)	326(50.39)	848(56.53)	297(50.17)	1711(52.36)	0.088
Total(n=3802)	624(53.02)	1062(45.02)	3315(54.7)	1747(45.79)	6748(50.32)	<0.001

Data are presented as number (%)

with soap in school the reported frequencies were 85.61%, 56.53% and 50.32%, respectively.

Hygienic behaviors of washing hands after using the toilet, washing hands before eating and washing hands with soap at school were significantly different between the four regions ( $p < 0.001$ ).

In all categories of washing hands, West region (with the second highest SES) had the highest frequency of hygienic behaviors ( $p < 0.001$ ). Washing hands after using the toilet, washing hands before eating and washing hands with soap in school was 87%, 60.97%, and 54.70%, respectively. The North-Northeast region was the top-

ranked region in tooth brushing (70.9%).

Figures 1-4 show the frequency of hygienic behaviors in Iranian children and adolescents at provincial level. As displayed in the maps, for daily tooth brushing, the highest and the lowest frequencies were reported from Gilan (78.75%) and Sistan & Baloochestan (53.67%) provinces, respectively. According to the students' responses, the provinces with respectively highest and lowest frequencies were as follows: Fars (93.33%) and Sistan & Baloochestan (71.94%) in always washing hands after using the toilet, Ilam (68.08%) and Gilan (38.33%) in always washing hands before eating, and Ilam (65.83%) and East

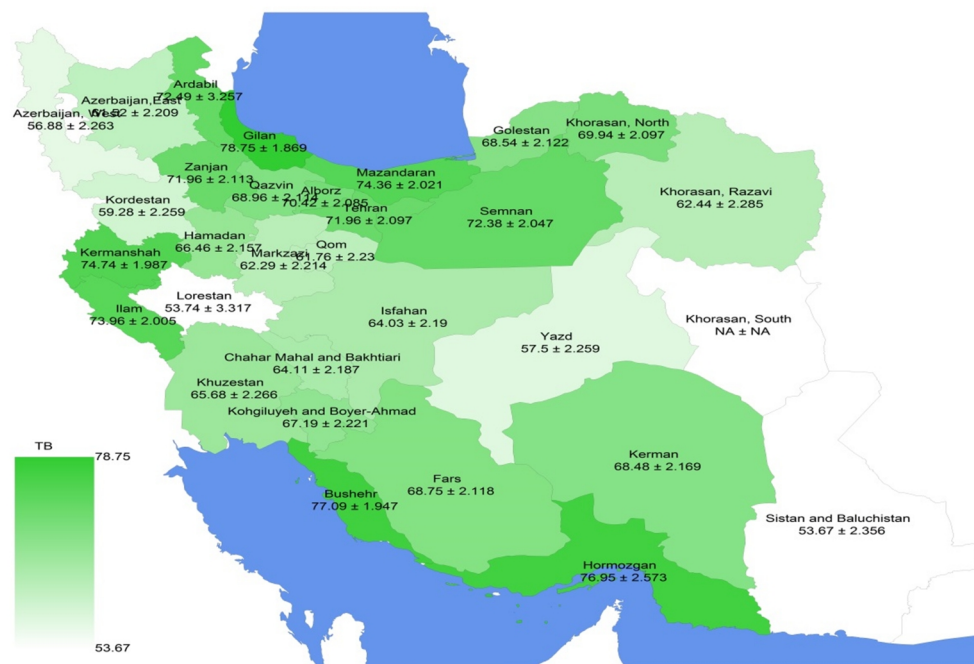


Fig 1. The Frequency of Daily Tooth Brushing in Iranian Children and Adolescents at the provincial level: the CASPIAN-IV study (Data are presented as %±SE)



Fig 2. The Frequency of Always Washing Hands after using the Toilet in Iranian Children and Adolescents at the Provincial Level: The CASPIAN-IV Study (Data are presented as %±SE)

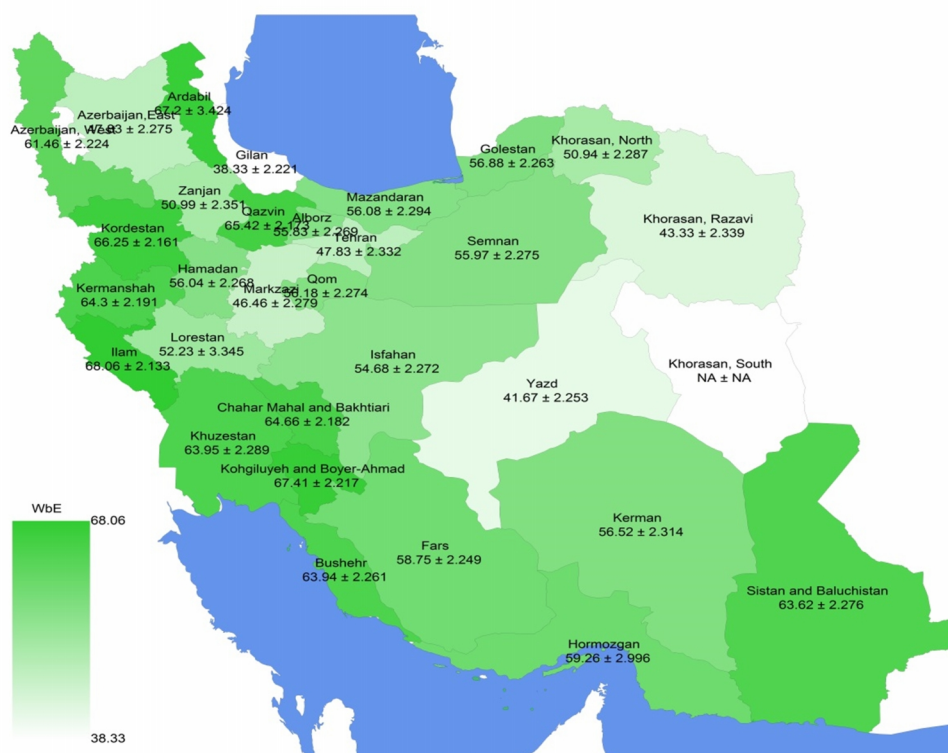


Fig 3. The Frequency of Always Washing Hands before Eating in Iranian Children and Adolescents at the Provincial Level: The CASPIAN-IV Study (Data are presented as %±SE)

Azarbaijan (%36.17) in always washing hands with soap in school.

### Discussion

In this study, some hygienic behaviors of Iranian children and adolescents were com-

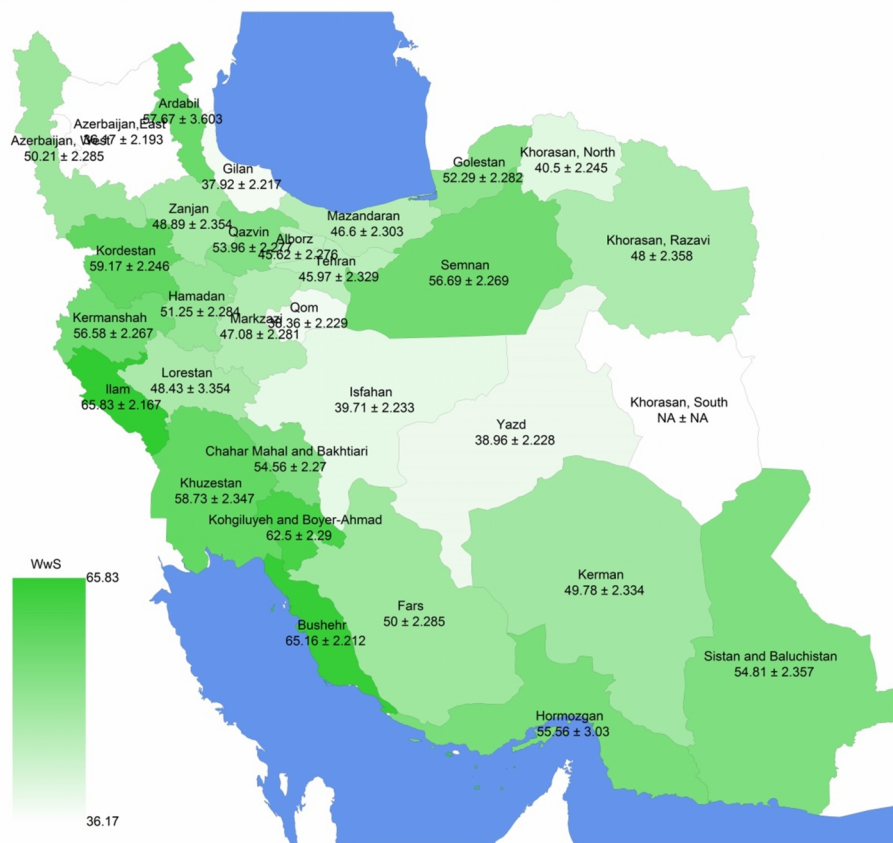


Fig 4. The Frequency of Always Washing Hands with Soap in School in Iranian Children and Adolescents at the Provincial Level: The CASPIAN-IV Study (Data are presented as %±SE)

pared according to the SES of their living region. We found that most participants followed hygienic methods; however, this was significantly different according to the SES of the living region.

Dental caries and periodontal diseases are the most effective problems on oral health with a spread of 60-90% of school children and adults in most of the industrial countries (29). Caries as a chronic disease is increasing in developing countries and although it is mostly related to oral health, it could also deteriorate the quality of life. It can alter eating and sleeping habits, dietary intake and metabolic processes among children and might affect school attendance, growth and weight gain (30). Therefore, tooth brushing should be started and established early in life to develop long-term health impacts in children. It is documented that early-established oral health behavior can remain at least until preschool age (31), and oral health in

childhood is a good predictor of adult oral health (32). The frequency of tooth brushing and oral health care status varies worldwide, depending on many variables including sex, urbanization and educational levels of parents. In Iran, at the national level, the frequency of tooth brushing was higher in girls than in boys, and likewise in rural than in urban areas (23), and in low and middle income countries girls have higher frequency of tooth brushing than boys (33). In contrast, a study in Iran revealed that sex disparity does not affect access and utilization of oral health care (34). Nonetheless, it is now well documented that health care utilization is attributed to socioeconomic status of people (35-37). People with a higher SES have access to health care and specialist care more than people with lower SES (38, 39). In our study, the west region of Iran with the second high SES rank had highest frequencies of hand washing behaviors. The lowest frequency of hand washing

after using toilet and tooth brushing was reported from Sistan & Baloochestan in southeast region with lowest SES rank. Previous studies have linked the educational attainment to the SES (40) and this may be one of the reasons of such differences in hygienic behaviors in Iran. Some studies have linked high educational level of parents to low incidence of dental caries in their children (41,42). The daily number of tooth brushing has also been reported important for preventing oral problems (43, 44). At least two times a day tooth brushing with a proper technique is recommended for oral health (45). In addition, in a study, using a fluoride toothpaste in addition to tooth brushing, reduced caries incidence in preschool children in the case group after 1.4 years of follow up period compared to those in the control group who only used brush (46).

In a study among Iranian children in 1998, the prevalence of dental caries was reported high in Ardebil, East Azarbaijan, Kurdistan, Khuzestan and Isfahan provinces, but it was low in Sistan & Baloochestan, Bushehr, Hormozgan, Qom and Qazvin (47). The lowest frequency for daily tooth brushing in our study belonged to Sistan & Baloochestan. The result seems to be in contrast with the mentioned study. This could be related to changes in oral health status, or may be related to the other variables such as SES, food regime, educational level and not only daily tooth brushing.

For the first time in Iran, the health status of the general population was evaluated by a national health survey in 1991 followed by the same survey in 1999 seeking health indicators and standards in Iran after the Islamic revolution. According to the surveys, in 1999, regular hand washing before meals and after using toilet were 83% and 61.4 in urban and rural population of Iran, respectively. Moreover, the prevalence of the mentioned behavior in the general population was 70% and 74.9% in 1991 and 1999, showing an improvement in health during these years (48). In our study, the prevalence of always washing hands after

using toilet was higher among urban students than in rural students, which was similar to previous surveys. Generally, many hygienic principles and health behaviors can be learned and reinforced in schools. Children may be in the chain of transmission of many communicable diseases in schools. Using common water and sanitation facilities in schools may result in this occurrence (49). A study in Colombia revealed that schoolchildren with proper hand washing behaviors were less likely to have gastrointestinal problems compared to others. Furthermore, school absenteeism due to gastrointestinal or respiratory conditions reported to be 20% less common in these children (9). The availability and accessibility of water and sanitation facilities in schools is highly important (50). For instance, using soap has been shown to improve hygienic habits by removing bacteria and parasites from the hands (51). Hand sanitizers have also been proposed as an appropriate alternative to hand washing in schools (52). Nevertheless, dirty latrines, lack of toilet papers or other sanitation facilities and overcrowding are of reasons making the school staff unable to teach fundamental health behaviors to children (50). Moreover, hygienic behaviors should be promoted in schools through appropriate programs. After an interventional study in Delhi among 281 students by a special methodology for health education, 95% felt that the hands should be washed frequently, and 42% shared the acquired information with their parents (53). Children can impact the behavior of their family and community (54).

Hand washing behavior after using toilet was more common than hand washing before eating or hand washing with soap in school among our study population. This is in favor of washing hands in key occasions, which has been reported before (55,56).

#### *Study Strengths and Limitations*

We used a validated Persian version of WHO-GSHS questionnaire for data collection. Moreover, a large number of students

from different geographical and socio-economic regions were enrolled and formed the study samples. The cross-sectional nature of the study helped us measure the prevalence of hygienic behaviors among schoolchildren with more accuracy. In this study, we did not analyze the relationship between parents' education and the number of tooth brushing a day or the relationship between tooth brushing and hand washing behaviors.

### Conclusion

The results of this study revealed that the current base of hygienic behaviors in schoolchildren at the national could help the health policy makers develop appropriate programs to promote health attitudes and define health priorities for children. The prevalence of hand washing behaviors and tooth brushing showed an acceptable level of hygienic habits in Iranian schoolchildren considering different socioeconomic status of living regions and families. However, the health standards and facilities need to be improved at the national, sub-national and provincial levels.

### Conflict of interest

The authors declared there is no conflict of interest.

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