

# COMPARATIVE STUDY OF HYGIENE HABITS IN THREE DIFFERENT GROUPS IN HUNGARY

Csenge Földvári-Nagy<sup>1,2</sup>, Kincsó Csepke Földvári-Nagy<sup>3</sup>, \*Dezső Módos<sup>4</sup>, Katalin Lenti<sup>4</sup>

<sup>1</sup>Cambridge Centre for Sixth-form Studies, Cambridge, United Kingdom

Principal: Stuart Nicholson

<sup>2</sup>Illyés Gyula High School, Budaörs, Hungary

Head of School: Péter Árendás

<sup>3</sup>Trefort Ágoston High School, Budapest, Hungary

Head of School: Zoltán Csapodi

<sup>4</sup>Department of Morphology and Physiology, Faculty of Health Sciences, Semmelweis University, Budapest, Hungary

Head of Department: Professor Gabriella Dörnyei, PhD

## Summary

**Introduction.** Gastrointestinal and urogenital infections cause great costs to health system and are responsible for many deaths all over the world. Personal hygiene is the simplest, most cost-effective method of prevention against these infections.

**Aim.** The aim of our study was to investigate personal hygiene habits of a selected Hungarian subpopulations and explore the subject of hygienic education.

**Material and methods.** 324 participants from three Hungarian subpopulations (high school students, employed university graduates, and health care students and professionals) filled in our self-designed, on-line, self-administered and anonymous questionnaire.

**Results.** The participants typically washed their hair 1 to 3 times a week, bathed once a day and brushed their teeth 1 to 2 times a day with no significant differences between groups. More than two third of the participants always washed their hands before a meal, but 21% of the respondents did not use soap for washing or did not wash their hands at all. Alarmingly, more than half of health care professionals and students and four fifth of high school students do not wash their hands before using a toilet.

**Conclusions.** Hand washing habits of the studied population, especially those of high school students, result in a high risk of urogenital, gastrointestinal and, in case of health care employees, nosocomial infections. The importance of health care education of young and adult people is not to be underestimated.

Keywords: personal hygiene, hand washing, soap usage

## INTRODUCTION

Hygiene is one of the greatest inventions of the human civilization. The importance of hygiene is underlined in all cultures, even if its scope is different throughout the world (1).

The relevance of hand washing and hygiene has a long history. Ignác Semmelweis saved lives of many women giving birth in his obstetrics department by ordering the doctors to wash their hands in chlorinated water (2). Since then, many research projects as well as organizations have been focusing on hygiene. WHO and UNICEF constantly promote and emphasize the importance of handwashing (1, 3). According to UNICEF, gastrointestinal infections are responsible for 1.5 million deaths of children every year (3). According to studies conducted in developing countries, washing hands with soap can reduce the incidence of gastrointestinal infections by 30-60% (4, 5). Fortunately, the incidence of gastrointestinal infections in Hungary is much lower than

in developing countries, nonetheless, the importance of handwashing cannot be underestimated. A study on Spanish elementary school pupils showed that number of days of absence due to acute gastrointestinal illnesses can be reduced by 36% with antiseptic hand washing (6).

Urinary tract infections (UTIs) are estimated to affect 150 million every year worldwide (7). In 2007, 10.5 million medical visits in United States alone were due to UTIs (8). The global costs of diagnosis and treatment of UTIs are considerable – in the United States alone, it was estimated to be 6 billion dollars in the year 1993 (9). Washing hands before using the toilet can help eliminated urogenital pathogens and thus, decrease the risk of urogenital infections.

Great amounts of gastrointestinal and urogenital pathogens, and even STD pathogens, can be detected on everyday objects, such as mobile phones, bills and coins, or door handles (10-13). This makes hygiene

habits, especially hand washing, extremely relevant in prevention of these diseases.

The diagnosis and treatment of infectious diseases causes great costs to the society. In 2007, direct medical costs of nosocomial infections was 28-45 billion dollars in the United States alone (14). In addition to direct health costs, other costs (e.g. sick leave) are also significant. Thus, the development of proper hygiene habits is not only the question of health policy, but also of the economic interest of the society.

In 2011, there were 52 850 reported cases of infectious gastroenteritis in Hungary, in 12 865 of which the pathogen was known (15, 16). 39 985 of the cases were diagnosed as unspecific gastroenteritis (15, 16). In 2012, the obligation to report the cases of unspecified infectious gastroenteritis was ceased in Hungary, and only gastroenteritis with known pathogen was reported. In 2015, 20 395 enteric infectious diseases with a known pathogen were reported based on microbial evidence and symptoms. The comparison of the data from 2012 and 2015 shows an increase in incidence of gastroenteritis caused by rotaviruses and *Campylobacter*, and a decrease in incidence of salmonellosis (15-17). There is no data available on the financial burden of the infectious gastroenteritis on the Hungarian economy and the health care system. Similarly, there is no available estimates on how adequate prevention could reduce these costs. Based on the international literature, it can be assumed that a significant amount of infections can be prevented with the education of proper hygiene rules.

Because of the lack of obligation to report urogenital infections, accurate data on urogenital infections are not available in Hungary.

Only a very limited number of research reports on hygiene habits of the Hungarian population can be found. These reports generally focus on smaller, non-representative populations. Ipsos Polling Institute surveyed the opinion of young people (aged between 15 and 25) on hygienic habits of their age group. According to their results, the majority of young people (80%) bathed daily, two-thirds of them (68%) brushed their teeth on a daily basis, and nearly one third of them (28%) brushed their teeth less often (18). In the representative survey conducted by Unilever Hungary Ltd. (19), the majority of elementary school pupils (1st-8th grade pupils; 90.5%) washed their hands after using the toilet. The majority of pupils (83.5%) washed their hands before a meal, but only 43.5% did it after the meal (19). Most of the primary school pupils washed their teeth in the evening (96%) and in the morning (88.5%), and approximately 24% of them brushed their teeth during the day (19). In a survey conducted in 2016 (20), more than a half (57%) of the participants (Hungarians aged 14-50) washed their teeth twice a day. Nearly one third brushed (28%) their teeth once a day and less

than a tenth (8%) washed their teeth more than twice a day (20). A notable minority (3%) did not wash their teeth on a daily basis (20).

## AIM

Our aim was to study whether personal hygiene habits of selected Hungarian subpopulations (secondary school students, employed university graduates and health care workers/students) are sufficient.

## MATERIAL AND METHODS

We designed an anonymous, on-line, self-administered questionnaire composed of closed questions. The questionnaire was constructed based on preliminary interviews and was validated by further interviews. There were seven questions altogether exploring the hygiene habits of the respondents: hand-washing and soap usage patterns related to eating and usage of the toilet, the frequency of hair washing, of showering/bathing and of teeth brushing.

The research was conducted on a highly educated social groups. We studied the hygienic habits on the following groups: students from top ranked high schools of Hungary (hereinafter referred to as Group 1; mean age = 17, SD = 1.74; n = 207); university graduated professionals (Group 2; mean age = 36, SD = 10.24; n = 57); health care students/employees (Group 3; mean age = 32, SD age = 9.19; n = 60).

A total of 324 questionnaires were processed. We ensured that item numbers were statistically comparable. We applied randomized sampling when it was necessary to ensure statistically comparable item numbers. The inclusion criteria were as follows: in Group 1: students of top ranked high schools; Group 2: employed university graduates; Group 3: medicine or health care students or employees of health care institutions. The study took place between November 2015 and April 2016. The non-respondent rate was less than 5%.

The questionnaires were distributed on-line. For Group 1, we directly contacted the teachers of top ranked high schools. They asked their students to complete the questionnaire. For Group 2, we distributed the questionnaire through on-line communities and selected the graduated respondents. For Group 3, we directly contacted the students of medical universities and employees of hospitals through on-line communities.

The statistical evaluation of responses was performed using IBM SPSS Statistic Base 20.0.0 software. Chi square tests were performed. We considered the results statistically significant when  $p < 0.05$ .

## RESULTS

There were no significant differences between the three groups in respect of hand-washing and soap usage patterns related to eating, as well as the frequency of hair washing, showering/bathing and teeth brushing

frequency ( $p > 0.05$ ). Therefore, we present and analyse this data for the whole study population together.

However, significant differences in hygiene habits related to toilet use (hand washing and soap usage patterns) were found between Group 1 and two other groups. Therefore, this data is presented separately for all the subgroups.

### Showering/bathing habits

The majority of the respondents washed their hair 1 to 3 times a week (54%), while a third (34%) washed their hair four times a week. 11% of the participants washed their hair every day (tab. 1). The vast majority of the studied population bathed or showered on a daily basis (91%) and a small proportion (6%) bathed approximately every other day (3-4 times per week). A minority (3%) bathed less frequently (1-2 times a week or less frequent) (tab. 1). Respondents typically washed their

Tab. 1. Answers of the general studied population ( $n = 322$ ) to the questions concerning the frequency of hair washing, bathing and brushing teeth. The most frequent answer is written in italics

How often do you wash your hair?			
Every day	4 times a week	<i>1-3 times a week</i>	Total
11%	34%	54%	100%
How often do you bathe?			
<i>Every day</i>	3-4 times a week	1-2 times a week or less	Total
91%	6%	3%	100%
How often do you wash your teeth?			
<i>1-2 times a day</i>	3-4 times a day	Not every day	Total
97%	0%	3%	100%

teeth 1 to 2 times a day (97%), but about 3% did not wash teeth daily. There was no respondent who declared to wash teeth more than two times a day (0%; tab. 1).

### Hand-washing habits and soap usage patterns related to having a meal

Half of the respondents (49%) washed their hands only before eating, and only 37% washed their hands before and after eating. 14% did not wash their hands neither before nor after a meal (tab. 2). 80% of those who washed their hands before eating used soap (tab. 2). 37% of the respondents washed their hands both before and after eating and used soap (tab. 2). A relatively small number of respondents (9%) did not use soap neither before nor after having a meal (tab. 2).

### Hand-washing habits and soap usage patterns related to toilet usage

The responses concerning toilet-related hygiene habits (hand washing, soap usage) are shown in table 3.

Only 19% of the Group 1 washed their hands before using the toilet (fig. 1), and 17% washed their hands before and after using toilet (tab. 3). Almost all of those who were aware of the importance of washing hands before using the toilet also used soap. 80% of the students from Group 1 washed hands only after using toilet. 88% of students used soap after using the toilet (fig. 2). The number of students in Group 1 who did not wash their hands neither before nor after using the toilet is less than 1%. 3% do not use soap at all, but 8.7% of the students did not know whether they were using soap or not (tab. 3).

47% of the university-graduated professionals from the Group 2 washed their hands both before and after using the toilet, protecting themselves and others from pathogens (fig. 1) 89% of persons who washed their hands before and after using the toilet used soap (tab. 3). 47% of the participants from the Group 2 washed hands only after using toilet and 89% of this subgroup used

Tab. 2. Responses of the entire studied population ( $n = 320$ ) concerning hand washing and soap usage habits. The most frequent answer is written in italics

Do you wash your hands before or after having a meal?					
<i>Yes, before eating</i>	Yes, after eating	Yes, both before and after eating	I do not wash my hands neither before nor after eating	No response	Total
49%	0%	37%	14%	0%	100%
Do you use soap before or after having a meal?					
<i>Yes, before eating</i>	Yes, after eating	Yes, both before and after eating	I do not use soap neither before nor after eating	I do not wash my hands neither before nor after eating	Total
40%	0%	37%	9%	14%	100%

Tab. 3. Answers to the question concerning hand washing and soap usage habits related to toilet usage of the entire studied population ( $n = 324$ ,  $n_1 = 207$ ,  $n_2 = 57$ ,  $n_3 = 60$ ). The most frequent answer to the question is written in italics

Group	Hand washing		%	Soap usage		%
Group 1	Only before using the toilet	3	1.5%	With soap	2	1%
				Without soap	1	0.5%
				Unknown	0	0%
	<i>Only after using the toilet</i>	166	80.2%	<i>With soap</i>	144	69.6%
				Without soap	5	2.4%
				Unknown	17	8.2%
	Both before and after using the toilet	37	18.4%	With soap	36	17.4%
				Without soap	0	0%
				Unknown	1	0.5%
	I do not wash hands neither before nor after using the toilet					1
Group 2	Only before using the toilet	0	0%	With soap	0	0%
				Without soap	0	0%
	<i>Only after using the toilet</i>	27	47.4%	<i>With soap</i>	21	36.8%
				Without soap	3	5.3%
				Unknown	3	5.3%
	Both before and after using the toilet	27	47.4%	<i>With soap</i>	21	36.8%
				Without soap	0	0%
				With soap, only before	3	5.3%
				With soap, only after	3	5.3%
	I do not wash hands neither before nor after using the toilet					3
Group 3	Only before using the toilet	2	3.3%	With soap	2	3.3%
				Without soap	0	0%
	<i>Only after using the toilet</i>	32	53.3%	<i>With soap</i>	28	46.7%
				Without soap	2	3.3%
				Unknown	2	3.3%
	Both before and after using the toilet	26	43.3%	With soap	26	43.3%
				Without soap	0	0%
I do not wash hands neither before nor after using the toilet					0	0%

soap (tab. 3). 5% of the respondents from the Group 2 did not wash hands neither before nor after using the toilet (fig. 3) and 5% did not use soap at all (tab. 3).

Only 47% of health care students and employees of the Group 3 washed their hands only before using

the toilet (fig. 1) and 43% washed hands both before and after using the toilet (tab. 3). Those who washed their hands before using the toilet or before and after using the toilet were using soap. 53% of the respondents from Group 3 washed their hands only after using

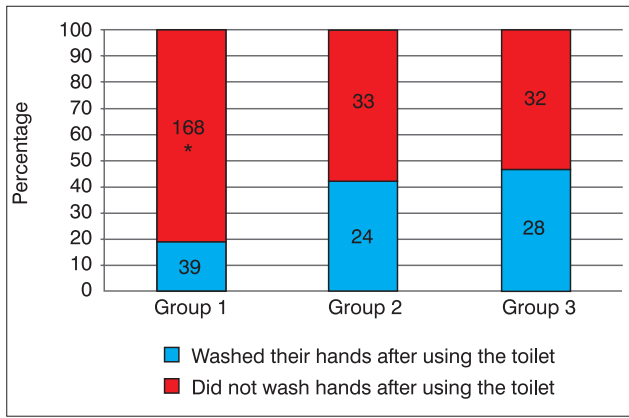


Fig. 1. Answers to the question concerning hand washing before using the toilet by three study groups. Significantly less respondents from Group 1 washed their hands before using the toilet ( $n_1 = 207, n_2 = 57, n_3 = 60, *p < 0.05$  [Chi square test comparing Group 1 to other groups])

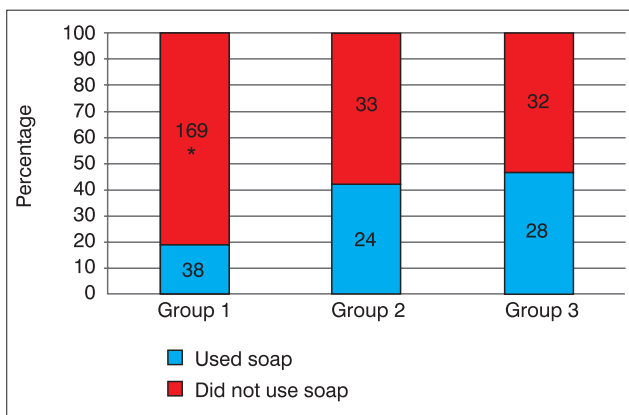


Fig. 2. Answers to the question concerning soap usage before using the toilet by three study groups. All the participants who washed their hands before using the toilet used soap as well, compare it with figure 1 ( $n_1 = 207, n_2 = 57, n_3 = 60, *p < 0.05$  [Chi square test comparing Group 1 to other groups])

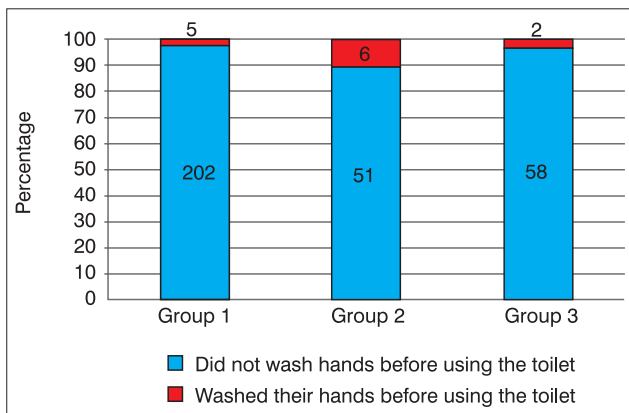


Fig. 3. Answers to the question concerning washing hands after using the toilet by three study groups. There were no differences between the groups ( $n_1 = 207, n_2 = 57, n_3 = 60, p > 0.05$  [Chi square test])

the toilet. 87.5% of the participants from Group 3 used soap (tab. 3). There was no respondent in Group 3 who did not wash hands neither before nor after using the toilet and only 3% did not use soap at all (tab. 3). However, it is shocking that more than half of health professionals and students from Group 3 did not wash their hands before using the toilet (fig. 1), which is essential for the prevention of nosocomial infections.

The most disappointing results of our study are:

- less than half of university-graduated professionals (Group 2) and health care students/employees (Group 3) (52.6 and 53.3%, respectively) and the majority (80.7%) of students (Group 1) did not wash hands before using the toilet (fig. 1),
- even though washing hands after using the toilet appears to be a generally accepted habit in all the studied groups (98.1; 94.74 and 96.7%, in Group 1, 2 and 3, respectively) (fig. 3), the usage of soap is less frequent (87; 79 and 90%, respectively) (fig. 4).

It can be perceived as positive that those who washed their hands before using the toilet generally used soap in all the studied groups (fig. 1, 2).

Washing hands without soap does not provide much protection against infections (21), therefore, the results concerning soap use are all the more disturbing.

### DISCUSSION

It can be summarized that the studied population bathed and brushed their teeth on a daily basis and washed their hair every other day (tab. 1). Contradictory to our preliminary expectations, none of the participants washed their teeth more than two times a day.

The situation concerning hand washing and soap usage habits, however, was not so favourable. While washing hands and using soap before meals was widespread (86 and 77% in Group 1 vs. 2 and 3, respectively)

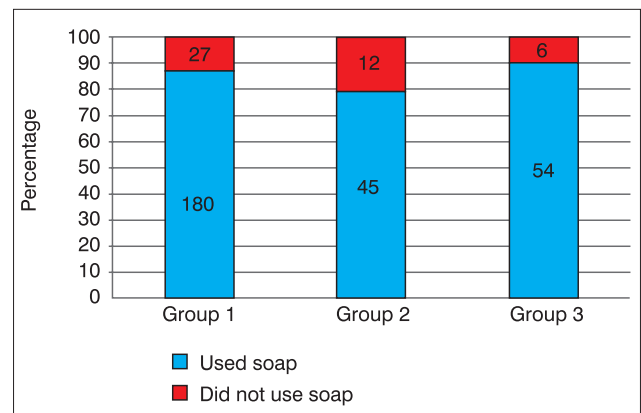


Fig. 4. Answers to the question concerning soap usage after using the toilet by three study groups. There were no differences between the groups ( $n_1 = 189, n_2 = 54, n_3 = 60, p < 0.05$  [Chi square test])

it is worrying that 14% of the studied population did not wash their hands before meals, in spite of the general popularity of this habit, and of hand washing being an important part of pre-school education from the age of three. These results are even more regrettable when it is taken into consideration that washing hands before meals is a very effective method for preventing gastrointestinal infections (6).

The relatively low rate of those who washed hands and used soap after having a meal (37 and 37% in Group 1 vs. 2 and 3, respectively) is probably explained by using tableware, as the hands of persons using tableware do not come in direct contact with potentially staining products (tab. 2).

The results of toilet-related hygienic habits are very distressing, especially in Group 1. More than half of the graduated employees from Group 2 and the health care students/employees from Group 3 (52.6 and 53.3% respectively) and the majority of students from Group 1 (80.7%) did not wash hands before using the toilet (tab. 3, fig. 1), despite the fact that men directly touch their genitals when urinating, while women can deliver the pathogens to their genitals via toilet paper. Numerous studies stated that the STD pathogens or faecal bacteria and fungal pathogens can be detected on money, handles or even on mobile phones (10-13).

The results concerning hygienic habits related to meals and toilet use are very disappointing. A significant percentage of our participants did not pay enough attention to personal hygiene, thus endangering their own health as well as health of others. What is particularly worrying, our study was conducted on a highly educated populations, and the national average may be even worse, taking into consideration that hygiene habits and education show a positive correlation (22, 23).

These results indicate that the level of hygienic education is not satisfying. Washing hands before meals and after using the toilet appears to be generally accepted among the participants of our study. But even in our highly educated population, the results are significantly below the target, which is 100% persons washing their hands. Although hand washing after using the toilet is common, and prevents spreading of the pathogens to the others, hand washing before using the toilet to protect oneself is significantly less popular. It can be concluded that our respondents, especially young ones, do not take enough preventive measures against urogenital infections, which poses risk both for the individuals and for the entire health care system.

The most important limitation of our study is that it only included highly educated persons. The majority of the sample came from Budapest and surroundings, so it was impossible to explore any differences between different areas of Hungary, as well as between different groups of Hungarian population. The study

concentrated on highly educated population, but the participants were not asked about their financial background. Participants of all surveys, even anonymous ones, tend to present themselves in better light as a consequence of social desirability (24, 25). Therefore, our results may be too optimistic about the current hygienic situation. Our self-completed questionnaires made it impossible for us to verify the truthfulness of the responses.

A bigger study on Hungarian population would surely show many differences between groups, and, as we suppose, even worse results.

## CONCLUSIONS

Our findings draw attention to serious public health issues and education policy problems. More effective health education of young people is needed to reduce the number of urogenital and gastrointestinal infections. The frequency of hand washing after meals and before using the toilet should be improved, especially in case of the latter. It would be worth considering to put more emphasis on education to establish proper hand washing habits to protect young people from urogenital infection.

## References

1. World Health Organization: WHO guidelines on hand hygiene in health care: first global patient safety challenge: clean care is safer care. World Health Organization, Geneva, Switzerland Patient Safety 2009: 262.
2. Semmelweis IP: Die Aetiologie, der Begriff und die Prophylaxis des Kindbettfiebers. 1<sup>st</sup> ed. Pest, Wien und Leipzig, Hartleben 1861.
3. Wardlaw T, Salama P, Brocklehurst C et al.: Diarrhoea: why children are still dying and what can be done. *Lancet* 2010 Mar 13; 375(9718): 870-872.
4. Curtis V, Cairncross S: Effect of washing hands with soap on diarrhoea risk in the community: A systematic review. *Lancet Infect Dis* 2003; 3(5): 275-281.
5. Ejemot-Nwadiaro RI, Ehiri JE, Arikpo D et al.: Hand washing promotion for preventing diarrhoea. *Cochrane Database Syst Rev* 2015; 9: CD004265.
6. Azor-Martínez E, Cobos-Carrascosa E, Gimenez-Sanchez F et al.: Effectiveness of a multifactorial handwashing program to reduce school absenteeism due to acute gastroenteritis. *Pediatr Infect Dis J* 2014; 33(2): e34-39.
7. Stamm WE, Norrby SR: Urinary tract infections: disease panorama and challenges. *J Infect Dis* 2001; 183 (suppl. 1): S1-4.
8. Schappert SM, Rechtsteiner EA: Ambulatory medical care utilization estimates for 2007. *Vital Health Stat* 2011; 169: 1-38.
9. Harding GKM, Ronald AR: The management of urinary infections; what have we learned in the past decade? *Int J Antimicrob Agents* 1994; 4(2): 83-88.
10. Akinyemi KO, Atapu AD, Adetona OO, Coker AO: The potential role of mobile phones in the spread of bacterial infections. *J Infect Dev Ctries* 2009; 3(8): 628-632.
11. Gerhardt A, Hammer TR, Balluff C et al.: A model of the transmission of micro-organisms in a public setting and its correlation to pathogen infection risks. *J Appl Microbiol* 2012; 112(3): 614-621.
12. da Fonseca TAP, Pessôa R, Sanabani SS: Molecular analysis of bacterial microbiota on Brazilian currency note surfaces. *Int J Environ Res Public Health* 2015; 12(10): 13276-13288.
13. Morvai J, Szabó R: A mobil kommunikációs eszközök szerepe a fertőzések átvitelében. *Orv Hetil* 2015; 156(20): 802-807.
14. Scott RD: The direct medical costs of healthcare-associated infections in U.S. hospitals and the benefits of prevention. CDC 2009.
15. Országos Epidemiológiai Központ. Az OEK előzetes jelentése a 2011. évben bejelentett fertőző megbetegedésekről. *Epinfo Epidemiológiai Inf Hetil* 2012 június; 19(25).
16. Országos Epidemiológiai Központ. Magyarország járványügyi helyzete 2011.
17. Országos Epidemiológiai Központ. Az Országos

Epidemiológiai Központ előzetes jelentése a 2015. évben bejelentett fertőző megbetegedésekről. *Epinfo Epidemiológiai Inf Hetil.* **18.** Ipsos Ltd. Tisztasági tükörkép. <http://www.domestos.hu/iskolai-program/kutatas/>. 2012 október; **19.** Unilever Magyarország Kft. Felmérés a gyermekek higiénés szokásairól, <http://www.domestos.hu/iskolai-program/kutatas/>. 2016. **20.** Gera I, Györfi A: A magyar lakosság orális egészségügyi ismeretei és szájhigiénés szokásai egy kérdőíves reprezentatív felmérés alapján. *Magy Fogorv* 2016; 2016(2): 92-98. **21.** Burton M, Cobb E, Donachie P et al.: The effect of handwashing with water or soap on bacterial contamination of hands. *Int J Environ Res Public Health* 2011; 8(1): 97-104.

**22.** Quihui L, Valencia ME, Crompton DWT et al.: Role of the employment status and education of mothers in the prevalence of intestinal parasitic infections in Mexican rural schoolchildren. *BMC Public Health* 2006; 6(1): 225. **23.** Bernabé E, Suominen AL, Nordblad A et al.: Education level and oral health in Finnish adults: Evidence from different life-course models. *J Clin Periodontol* 2011; 38(1): 25-32. **24.** Furnham A: Response bias, social desirability and dissimulation. *Personal Individ Differ* 1986; 7(3): 385-400. **25.** Johnson TP, Fendrich M, Mackesy-Amiti ME: A validation of the Crowne-Marlowe social desirability scale. *Qual Quant* 2012; 46: 1883.

#### Conflict of interest

None

Received: 2.09.2016

Accepted: 28.10.2016

Correspondence to:

\*Dezső Módos

Centre for Molecular Informatics

Department of Chemistry

University of Cambridge

Lensfield Road

Cambridge, CB2 1EW

United Kingdom

tel.: +44 1223 336432

e-mail: dm729@cam.ac.uk