



Assessment of school readiness for medical emergencies in Riyadh, Saudi Arabia

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General Note

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ABSTRACT

Background: Children spend one third of their day in school and are vulnerable to physical injuries because of lack of awareness about dangerous situations. **Aims:** We aimed to evaluate medical emergency preparedness among primary and intermediate schools in Riyadh, Saudi Arabia and to compare private and public schools' readiness in term of equipment's, skills, knowledge and attitude toward life support courses. **Method:** A cross-sectional study was conducted on 196 school staff from 39 schools using a validated questionnaire to assess equipment and staff knowledge. **Results:** 44% (n=83) of school staff had Basic Life Support (BLS) training, of which 77% were staff from public schools. Staff in private schools had higher practical training (63%) than those in public schools (33%). There was a significant different in the availability of bronchodilators and epinephrine pen between private and public schools (p-value 0.04 and 0.01 respectively). Overall, both sectors showed poor staff knowledge of medical emergency situations. **Conclusions:** This study showed insufficient knowledge and skills in both sectors; however the private sector has greater knowledge and skills. A positive attitude was recorded toward BLS.

Keywords: Basic life support (BLS); Emergency; Equipment; Schools; Teachers; First aid.

1. INTRODUCTION

Children are the cornerstone of the future of every community and their needs, in every aspect, should be a priority. Children's health is particularly important because they are more vulnerable to injuries due to underdeveloped mental and physical abilities and, therefore, require first aid more often than adults (Durch and Lohr, 1998; Cummins *et al.*, 1991). Children spend most of their time in school and physical injuries are one of the leading causes of death and major disabilities among school-age children (World Health Organization, 2010). One study reported that a high number of childhood injuries (88%) were directly related to physical activity, and approximately 20% of all physical activity-related injuries occurred during school hours (Spinks *et al.*, 2006). Another study reported that 20% of emergency department visitors were children aged 18 years or younger (McDermott *et al.*, 2006).

The main principle of first aid is to minimize the mortality and morbidity of any illness or injury until expert help is present (Singletary *et al.*, 2015). It is evident that first aid training in schools can improve injury prevention and create a healthy school environment (Alhabdan *et al.*, 2013). Two of the most common life-threatening medical conditions in school-aged children are epilepsy and allergy. In Saudi Arabia, the prevalence of epilepsy and asthma are 6.54\1000 (Alaqeel and Sabbagh, 2013), and 4.05\100 (Moradi-Lakeh *et al.*, 2015), respectively. These medical conditions can cause death if immediate medical attention is not delivered (Plus G, 2019; Holland and Riley, 2014). To ensure the safety of children in schools and to avoid preventable complications of emergency medical situations, it is important for school staff and teachers to have the skills and knowledge necessarily to deal with life-threatening situations.

A number of studies addressing school emergency preparedness have been conducted. A Turkish study found that most teachers did not have the correct knowledge and attitudes about first aid (Baser *et al.*, 2007). Another study from Greece showed that only 21% of teachers had ever participated in life support courses, and most of them did not possess adequate theoretical knowledge in the management of adult cardiac arrest or foreign body airway obstruction (Patsaki *et al.*, 2012). In Saudi Arabia, a 2014 study conducted in Al- Madinah city assessed the knowledge of first aid among teachers and showed that only 7.4% had Cardiopulmonary Resuscitation (CPR) knowledge. However, the majority of participants (92%) identified the need for proper first aid training programs in schools (Alharbi L. *et al.*, 2016).

Another study that evaluated the preparedness of primary schools in responding to health-related emergencies was conducted in Jeddah city, Saudi Arabia. This study aimed to understand if teachers had previous first aid training and then assessed knowledge of common medical emergencies, principles of first aid and Basic Life Support (BLS). The authors found that 58.5% had previous training in first aid and BLS but how low knowledge of cardiopulmonary resuscitation (11.9% answering this question correctly). Participants had a positive attitude towards first aid training in school settings (Bashir and Bakarman, 2014). Only one study was conducted in Riyadh city, Saudi Arabia. This study included 228 teachers from five public schools and found that more than half of the teachers (57%) had no previous information regarding CPR (Alharbi M *et al.*, 2016). However, none of the studies identified explored the availability of equipment or whether there are differences between the public and private school sectors.

The objectives of this study are to assess medical emergency preparedness in primary and intermediate schools in different regions of Riyadh city. We will compare private and public schools' knowledge, skills and equipment availability. Additionally, we will assess school staff's attitude towards and willingness to attend BLS and first aid courses.

2. MATERIAL AND METHODS

Settings and Study Population

A cross-sectional study was performed in Riyadh, Saudi Arabia. Schools with male students only were chosen randomly from a list of schools divided by location and sector. Schools that were located in Riyadh outskirts and/or had a specialized curriculum (e.g. international schools) were excluded. Five members from each school involved in medical emergencies were invited to participate (Principal, Vice Principal, science teacher, physical education teacher, and school nurse/ health supervisor). The science and physical education teachers were selected because of their involvement in the laboratory and gym, classes in which students are more prone to injuries.

Sample Size Calculation

The population frame for this study was primary and intermediate schools in Riyadh in an equal stratum from private and public schools. The total number of schools available for invitation before applying the inclusion criteria was 1151 schools. After applying the inclusion criteria, 1088 schools were eligible for selection.

Based on the normal probability proportion, the estimated school staff sample size was calculated to be $n=196$ using the following equation:

$$n = \frac{z^2 p (1-p)}{e^2} = \frac{1.96^2 0.5 (1-0.5)}{0.05^2} = 196$$

Which was corrected by the finite population correction:

$$n \times \sqrt{\frac{N-n}{N-1}} = 196 \times \sqrt{\frac{1088-196}{1087}} = 177.5$$

In which N is the total number schools.

177.5 divided by the number of the school staff who would participate in the in each school which is five. Therefore, the number of schools included was calculated to be 35. However, this was rounded up to 40 schools taking into consideration response rates and to make division between the two groups easier.

Questionnaires

A self-administered questionnaire validated in previous studies (Bashir and Bakarman, 2014) was used for data collection. The questionnaire was divided into five sections. Section (A) included demographic information; Section (B) asked whether school staff had received formal training, the type of training (practical, theoretical, or both) and the date of training (the latter was asked to assess certificate validity because training certificates provided by the American Heart Association are only valid for two years); Section (C) included a checklist of equipment available in the facility based on a medical emergency response plan developed in the United states of America (The Federal Emergency Management Agency, 2016) including first aid kit and its accessibility, bronchodilator, automated external defibrillator (AED), epinephrine auto-injector (epinephrine pen), and bandages. Section C was only filled in once per school, by the Principal, Vice-Principal or the person in charge of the equipment; Section (D) included ten Multiple Choice Questions (MCQs) about BLS and basic first aid principles in order evaluate staff knowledge; and Section (E) contained questions to evaluate staff attitudes towards the importance of BLS and whether training should be mandatory. To make comparison possible, a score was developed for equipment availability (out of 6), knowledge (out of 10), and attitude (out of 30).

Statistical Analysis

Data was entered and analyzed using Statistical Package for Social Sciences (SPSS) version 21 (IBM SPSS statistics version 21, 2012). Frequencies and percentages were used to represent the qualitative data. Descriptive measures, such as mean and standard deviation, were applied on quantitative data. Chi-square and Fisher's exact test were used to determine the association between schools' readiness for emergencies by sector. For the comparison of equipment availability, knowledge and attitude scores, the independent t-test was used. A p-value less than 0.05 were considered significant.

Ethical considerations and funding

This study has been approved by the The Institutional Review Board (IRB) of Collage of medicine, King Saud University with the project number E-19-4319. This study is funded by The Deanship of Scientific Research Chairs at King Saud University.

3. RESULTS

Forty randomly selected schools were invited to the study, of which 39 participated. Out of 200 questionnaires handled, 196 were returned (response rate of 98%). Table 1 shows summary information on the schools and study participants. The majority of participants were teachers (58.2%) with the mean age of 41 years. Surprisingly, only five schools had nurses (12.8%).

Table 1 Data on included schools and study participants

Schools	
Total No. of schools	39
No. schools based on sectors	
Public	20
Private	19
No. schools based on level	
Primary	19
Intermediate	20
No. schools based on location	
North	8
South	8
East	8
West	7
Center	8
Respondent	
Total No. of respondents	196
Age [mean (SD)]/ years	40.7 (9.3)
Subject's occupation; n (%)	
Principal	35 (17.9%)
Vice Principal	42 (21.4%)
Teacher	114 (58.2%)
Health counsellor	3 (1.5%)
Other	2 (1%)

Training

The total number of participants with BLS training was 83 (44.1%). Out of the 83 trained staff, 41 (49.3%) had practical training and the remaining 42 (50.7%) had theoretical training only. The most common site of training was in the workplace (52.6%), followed by university (32.9%), with hospital and other locations making up the remainder. When comparing public and private schools, private schools had 44 trained individuals while public schools had 39 (p -value=0.12). Around 77% of the trained staff from public schools and 52% from private schools had completed their last training more than two years prior (p -value=0.03). The private sector had a greater number of practically trained individuals (63%) compared to the public sector (33%) (p -value <0.05).

Equipment

All participating schools had first aid kits except one, which was a public school. In general, the two sectors differed significantly in the availability of bronchodilators and epinephrine pens (p -value= 0.04 and 0.02, respectively). Only two private schools had an AED (Table 2). There was a significant difference in equipment availability between the two sectors (p -value=0.002) (graph 1).

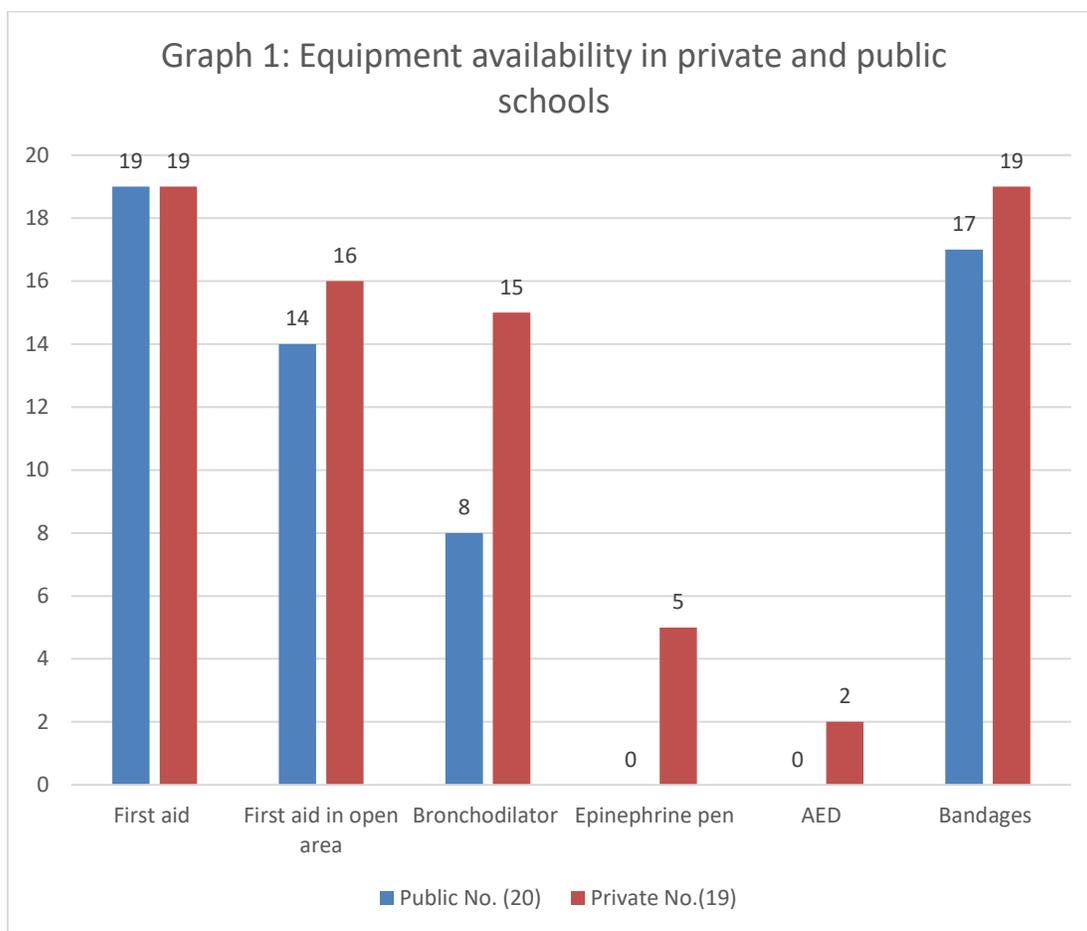


Table 2 Equipment availability based on sector

	Public N = 20	Private N = 19	<i>p</i> -value
First aid kit			
Yes	19	19	1.00
No	1	0	
First aid kit in open area			
Yes	14	16	0.23
No	6	2	
Bronchodilator			
Yes	8	15	0.04
No	11	4	
Epinephrine pen			
Yes	0	5	0.02
No	19	12	
AED			
Yes	0	2	0.21
No	19	15	
Bandages			
Yes	17	19	0.49
No	2	0	

*Fisher's exact test

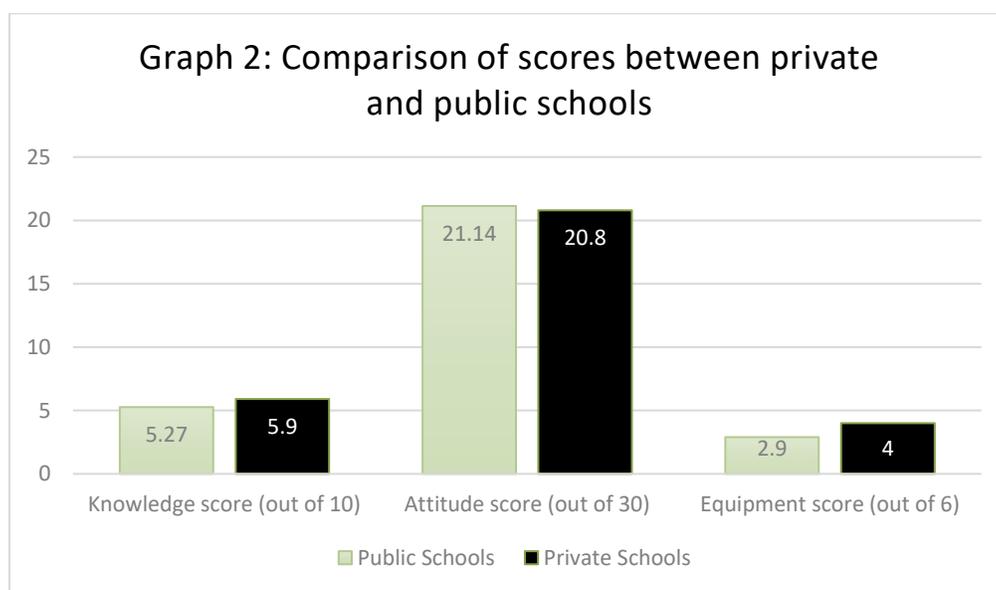
Knowledge and attitude

The private sector had a higher mean knowledge score (5.9) than the public sector (5.27) (p -value=0.01). There was no difference in attitude found between sectors (Table 3 & graph 2).

Table 3 Comparison of knowledge, attitude, and equipment scores between sectors

Comparison based on sectors	Mean (SD)		p -value
	Public	Private	
Knowledge score	5.27 (1.87)	5.9 (1.68)	0.01
Attitude score	21.14 (4.25)	20.8 (5.30)	0.63
Equipment score	2.9 (1.1)	4.00 (0.94)	<0.05

*independent t-test



4. DISCUSSION

Our main objective in this study was to assess and compare private and public schools' readiness when facing medical emergencies, in terms of logistics (i.e. equipment available) and knowledge (i.e. BLS and first aid training). The main findings of this study were that the primary and intermediate school teachers have inadequate knowledge and unsatisfactory skills to manage medical emergencies. While there are significant differences in the availability of first aid equipment between the sectors (favoring the private sector), there is a positive attitude toward taking first aid and BLS courses. Children spend a considerable amount of time in schools. Since schools' staffs are the first to encounter of any unfortunate medical situation, they should be prepared with knowledge and skills to appropriately manage these incidents to reduce mortality and morbidity. Our study found that knowledge was significantly higher in the private sector.

Our study also found that 44.1% of staff had previous training in first aid and BLS. Other studies have reported varying results, for example locally this figure is 36.7% in Al-Qassim and 58.5% among female teachers in Jeddah (Al Enizi *et al.*, 2016; Patsaki *et al.*, 2012). Internationally, estimates range from 45.5% in Turkey to 21.03% among high school teachers in Greece (Alharbi *et al.*, 2016; Bashir and Bakarman, 2014). There are various reasons that could explain this low prevalence in general and the significant difference between the two sectors. One of the possible reasons for the low prevalence is that less than half of teachers had previous training, but one could argue that there is no significant difference between the trained and untrained individual. On the other hand, the time since last training could explain the significant difference between public and private sectors. Our findings show there was no significant difference between sectors in number of trained staff but a marked difference in duration since last training, with 52% of staff in the private sector completing their last training more than two years prior compared to 77% in the

public sector. Since it is relatively rare for school staff to encounter situations which require CPR or BLS, while last training was more than two years, it could be difficult to retrieve correct information and skills suitable for such situations (Anderson *et al.*, 2011). Also, the type of training may be important. In our study half of all trained staff had only theoretical training, which may not provide the skills to perform in a real-life medical situation.

Attitude and willingness to undertake first aid courses are positive with no significant difference between sectors, which is in parallel with other local and international studies (Patsaki *et al.*, 2012; Alharbi L *et al.*, 2016; Bashir and Bakarman, 2014). In order to appropriately manage situations which require first aid, first aid equipment must be available and easily accessible, such as bronchodilator for asthma cases. In our study, the private sector showed better access to bronchodilators and epinephrine pen however both sectors lack AED. Since asthma is a common disease in Saudi Arabia with prevalence of 4.05% (Moradi-Lakeh *et al.*, 2015), asthma attacks are more likely to be encountered demonstrating the need for first aid equipment.

Our study highlights the need for equipment that is easily accessible and annual training, particularly practical training, to improve the knowledge and skills among school staff and to improve student health outcomes. This study has several strengths. It is among the first research to assess school readiness for medical emergencies in the Central region of Saudi Arabia. It is also the first to assess emergency equipment availability Saudi Arabian schools. This is an important issue for health planning and community involvement in health promotion and management with the recent advances in the Saudi's health care system. The limitations of this study include that data were collected from male schools only with no information about the female schools. In addition, data were collected from only five staff from each school, which might influence the accuracy of data given that all teachers are in direct contact with students and may face a medical emergency at any time.

5. CONCLUSION

Medical emergency conditions can happen anywhere at any time. In our study, we found that there is poor knowledge and skills in both primary and intermediate schools and that staff from private schools have greater knowledge and skills than those in the public sector. The overall attitude towards BLS and first aid training was positive. We recommend that school staff take practical courses on first aid and BLS. Additionally, the availability of emergency equipment should be reviewed and adopted at each school. Further studies with larger sample size and in both male and female schools are required to confirm our findings.

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List of abbreviations

Automated External Defibrillator (AED), Basic life supports (BLS), Cardiopulmonary Resuscitation (CPR), Multiple Choice Questions (MCQs), Statistical Package for Social Sciences (SPSS).

Contribution Details

Dr. Alduraywish designed the study, supervised the data analysis and revised the manuscript and is the Guarantor of the research. Dr. Abdulkader, Dr. Alsuwaida, Dr. Alsultan, Dr. Almanie, Dr. Alqahtani and Dr. Alotaibi performed literature review, collected data, performed statistical analysis and wrote the first draft of the manuscript. Dr. Aldakheel critically revised the final draft of the manuscript. All authors approved the final version of the manuscript.

Conflicting Interest

All authors declare that there is no conflict of interest.

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Presentation

The abstract of this manuscript has been presented as "Poster presentation" in the (First Student Research Forum).

Organisation: Student council at the college of Medicine.

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REFERENCE

- Al Enizi BA, Saquib N, Zaghloul MS, Alaboud MS, Shahid MS, Saquib J. Knowledge and Attitudes about Basic Life Support Among Secondary School Teachers in Al-Qassim, Saudi Arabia. *International Journal of Health Sciences*, 2016; 10(3), 415.
- Alaqeel A, Sabbagh AJ. Epilepsy; What Do Saudi's Living in Riyadh Know? *Seizure* 2013;22(3), 205-209.
- Alhabdan S, Zamakhshary M, Al Naimi M, Mandora H, Alhamdan M, Al-Bedah K, et al. Epidemiology of Traumatic Head Injury in Children and Adolescents In a Major Trauma Center in Saudi Arabia: Implications for Injury Prevention. *Annals of Saudi Medicine* 2013; 33(1), 52-56.
- Alharbi L, Alshareef A, Alshantqi A, Sandokji A, Aloufi A, Alshantqi M, et al. Assessment of First Aid Knowledge among School Instructors in Al-Madinah Al-Munawarah, City, Saudi Arabia 2014. *International Journal of Advanced Research* 2016; 4(6), 1329-1336.
- Alharbi MM, Horaib YF, Almutairi OM, Alsuaidan BH, Alghoraibi MS, Alhadeedi FH, et al. Exploring the Extent of Knowledge of CPR Skills Among School Teachers in Riyadh, KSA. *Journal of Taibah University Medical Sciences* 2016; 11(5), 497-501.
- Anderson GS, Gaetz M, Masse J. First Aid Skill Retention of First Responders within the Workplace. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 2011; 19(1), 11.
- Başer M, Çoban S, Taşci S, Sungur G, Bayat M. Evaluating First-Aid Knowledge and Attitudes of a Sample of Turkish Primary School Teachers. *Journal of Emergency Nursing* 2007; 33(5), 428-432.
- Bashir SM, Bakarman MA. Are Our Children in Safe Hands? Evaluating the Preparedness of Primary School Staff in Jeddah, Saudi Arabia in Responding to Health-Related Emergencies. *Life Science Journal* 2014; 11(11), 986-989.
- Cummins RO, Ornato JP, Thies WH, Pepe PE. Improving Survival from Sudden Cardiac Arrest: The "Chain of Survival" Concept. A Statement for Health Professionals from the Advanced Cardiac Life Support Subcommittee and the Emergency Cardiac Care Committee, American Heart Association. *Circulation* 1991; 83(5), 1832-1847.
- Durch JS, Lohr KN. Emergency Medical Services for Children. Institute of Medicine Report (1993).
- FEMA.gov. Developing High-Quality School Emergency Operations Plan 2019. [online] Available at: <https://www.fema.gov>.
- Holland K, Riley E. ADHD by the numbers: facts, statistics, and you. Healthline Networks Inc 2014. [online] Available at: <https://www.healthline.com/health/adhd/facts-statistics-info-graphic>. [Accessed 10 August 2019].
- McDermott KW, Stocks C, Freeman WJ. Overview of Pediatric Emergency Department Visits 2015; Statistical Brief# 242. [online] Available at: <https://www.hcup-us.ahrq.gov/reports/statbriefs/sb242-Pediatric-ED-Visits-2015.pdf>.
- Moradi-Lakeh M, El Bcheraoui C, Daoud F, Tuffaha M, Kravitz H, Al Saeedi M, et al. Prevalence of Asthma in Saudi Adults: Findings from a National Household Survey, 2013. *BMC Pulmonary Medicine* 2015; 15(1), 77.
- Patsaki A, Pantazopoulos I, Dontas I, Passali C, Papadimitriou L, Xanthos T. Evaluation of Greek High School Teachers' Knowledge in Basic Life Support, Automated External Defibrillation, and Foreign Body Airway Obstruction: Implications for Nursing Interventions. *Journal of Emergency Nursing* 2012; 38(2), 176-181.
- Plus G. AAFA.org (2019). Asthma Facts. [online] Available at: <http://www.aafa.org/page/asthma-facts.aspx>. [Accessed 13 August 2019].
- Singletary E, Charlton N, Epstein J, Ferguson J, Jensen J, MacPherson et al. Part 15: First Aid. *Circulation* 2015; 132, pp.S574-S589.
- Spinks AB, McClure RJ, Bain C, Macpherson AK. Quantifying the Association between Physical Activity and Injury in Primary School-Aged Children. *Pediatrics* 2006; 118(1), e43-e50.
- Spss I. IBM SPSS statistics version 21. Boston, Mass: International Business Machines Corp, 2012; 126.
- World Health Organization. School Health and Youth Health Promotion: Facts. 2010; [online] Available at: http://www.who.int/school_youth_health/facts/en/index.html.