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Assessment of Lebanese Private Schools' Preparedness for Medical Emergencies, with a Focus on School Nurses: A Cross-Sectional Study

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Abstract

Introduction: School students and staff can encounter a wide range of health-related emergencies, which, without proper management, can result in life-threatening consequences. Nurses, being the first health providers, should be well-prepared and equipped to handle these emergencies before emergency medical services arrive.

Aim: This cross-sectional study investigated the level of preparedness among Lebanese private schools for life-threatening health-related emergencies, along with assessing the confidence of private schools' nurses in managing such critical situations.

Methods: Data was collected through a self-completed questionnaire sent to all private schools' nurses registered with the Order of Nurses of Lebanon. A total of 86 nurses participated in the study.

Results: The study revealed satisfactory levels of education and training certification among the participating nurses. However, it identified a concerning shortage of emergency equipment and medications. Additionally, only 36.0% of nurses reported the existence of a "Medical Emergency Response Plan" in their respective schools. The study also found statistically significant associations, between (1) increased experience of nurses and enhanced confidence in managing diabetes, asthma, and allergic reactions, and (2) the presence of a "Medical Emergency Response Plan" and a high level of confidence in handling heat-related illnesses and asthma.

Conclusion: The study reveals a lack of preparedness in Lebanese private schools to handle health emergencies. Recommendations include utilizing study findings by relevant stakeholders to advocate for better preparedness in private schools. School directors and policymakers can benefit from these insights to take necessary actions. Furthermore, there's a call for further research to assess the preparedness of public schools, which are even more susceptible to political and economic instability, and identify necessary actions to address any gaps.

Keywords: School Health; Health Emergencies; Preparedness; School Nurses; Medical Emergency Response Plan

List of Abbreviations: AED: Automated External Defibrillator; COVID-19: Coronavirus Disease 2019; CPR: Cardiopulmonary Resuscitation; EMS: Emergency Medical Services; MERP: Medical Emergency Response Plan; SES: Socio-Economic Status; WHO: World Health Organization

Introduction

Schools' students can encounter a wide range of medical life-threatening emergencies resulting from simple injuries, chronic disease complications, or unexpected illnesses [1]. For instance, according to the World Health Organization (WHO), school-aged children are vulnerable to injuries that are considered the leading cause of death in that age group [2], with 10 to 25% of them happening in schools [3]. Therefore, school nurses, who are the primary health providers and first emergency responders in schools, must be well-prepared to make quick decisions and take prompt action, allowing for a proper and timely response to life-threatening emergencies. To achieve this, school nurses should possess the necessary knowledge and confidence, along with the required equipment and planning, to initiate an emergency response, contact emergency medical services (EMS), and effectively handle the emergency. Nevertheless, the preparedness and effective management of emergencies cannot solely rely on the nurse; it necessitates the establishment of a comprehensive health services' package at the school level. These services should encompass various aspects, including but not limited to acute emergency care, management of chronic diseases, and effective care coordination [4]. In fact, a study conducted by Qureshi et al. in 2018 [5] found that the most commonly reported school medical incidents requiring first-aid treatment were: stomachache, fainting, bleeding/trauma, sprains, chocking due to a foreign body, seizures, anaphylaxis and accidental consumption of substances [6]. Nonetheless, life threatening complications due to chronic diseases such as asthma, diabetic crises, and epilepsy, are also frequently encountered in schools [1]. Therefore, first aid provided in schools - which is the first treatment received before medical professional treatment- should be effective and timely to reduce the suffering while improving the prognosis [7]. To have an effective response, early planning before emergencies occur was found to be crucial to ensure that all elements, such as availability of a medical emergency response plan (MERP), individualized plans for students with chronic conditions or special needs, the needed staff, as well as the necessary medications and equipment, are secured [1, 8, 9]. As for the MERP, it includes emergency identification, management until professional emergency medical services arrive and safe transportation to a health facility. The school nurse plays a key role in the designing and implementation of the MERP based on the school's capacities and characteristics. In addition, this plan must be communicated to school personnel who must be aware of their responsibilities [1, 8].

Since 2019, the Lebanese health and education sectors have been profoundly impacted by one of the worst socio-economic crises [10-12]. These sectors have experienced significant losses in their most skilled human resources. Additionally, the health sector has been severely affected by the Coronavirus Disease 2019 (COVID-19) pandemic, further burdening the already fragile health system and resulting in increased morbidity and mortality. This is primarily due to disruptions caused by brain drain, limited resources, and service provision interruptions. Furthermore, the devaluation of the national currency and the socioeconomic crisis have led to challenges in private schools in Lebanon, affecting their ability to provide high-quality education and limiting enrolment to only those students whose families can afford tuition fees. Amidst the tuition fees crisis, these schools have struggled to maintain educational standards and retain their human resources. Against this backdrop of both COVID-19 and the socio-economic crisis, a cross-sectional study was conducted to investigate the preparedness levels of Lebanese private schools for medical emergencies. The study also aimed to determine to what extent nurses feel capable of handling health-related life-threatening emergencies that may occur during the school day. The specific objectives were (1) to assess private schools' preparedness in terms of medical equipment and supplies as well as the availability of training and medical emergency response plans; (2) to identify the most encountered medical emergencies in schools; & (3) to assess the level of confidence of school nurses in handling these emergencies as well as the factors affecting their confidence. This study, standing as a pioneer in its field, was initiated during an un-

precedented crisis amidst a context of fragile governance at the national level and diminished oversight from the public health and education sectors. These factors amplify the study's importance in monitoring school situations, guiding advocacy efforts, and informing stakeholders about necessary actions and decisions to establish schools prepared to manage health-related emergencies affecting school staff or students.

Materials and Methods

Participants

The study targeted Lebanese private school nurses. The inclusion criteria comprised holding a technical or universal diploma in nursing and possessing proficiency in either English or French, as the survey was distributed in these two languages. Initially, a convenience sampling approach was employed to recruit participants, targeting all school nurses working in Lebanon and registered with the Order of Nurses of Lebanon (consisting of 185 nurses).

Data Collection Tool

Regarding the questionnaire utilized in this study, the researchers employed a validated tool initially developed by Olympia et al. in 2005 [13, 14]. The questionnaire, originally in English, was subsequently translated into French to ensure comprehension among all Lebanese nurses. It was then back-translated to verify accuracy. Additionally, the questionnaire underwent pilot testing with three nurses to ensure comprehension and to address any linguistic ambiguities. The questionnaire comprised five sections covering:

- School nurses' education and socio-demographic characteristics including age, gender, marital status, socio-economic status, highest education level, school nurses' experience, and certification. The socio-economic status (SES) was determined by the household crowding index (number of household members per room), with a crowding index lower than 0.75 indicating a high SES, between 0.75 and 1.5 indicating a medium SES, and higher than 1.5 indicating a low SES [15].

- School characteristics including the number of students in the school, and the number of student visits to the school nurse per week.

- The most encountered medical emergencies at school from the following list: Shortness of breath, minor sprain or strain, major laceration, extremity fracture, head or neck injury, psychological emergency, seizure, loss of consciousness, airway obstruction, cardiac arrest, dehydration, chest pain or palpitation, anaphylaxis, syncope or passing out, severe abdominal pain, overdose or poisoning.

- Preparedness for life-threatening emergencies in terms of: the presence of a MERP, practice of the MERP (if available) availability of authorized staff identified for medical decision-making, availability of cardiopulmonary resuscitation (CPR), availability of a nurse on an average school day, presence of a school health provider during all school hours, presence of an athletic trainer during all athletic events, availability of a procedure to contact EMS, the time needed for EMS to reach the school, the time needed to reach the nearest hospital.

- Medical emergency scenarios and the availability of emergency equipment. This section aims at determining the confidence levels of school nurses in managing ten different life-threatening emergencies using a 5-item Likert scale ranging from 1 to 5 (very unconfident to very confident) and including: asthma, allergic reactions, cardiac arrest, bleeding or fractures, diabetic crisis, head and neck injuries, seizures, heat-related illness, poisoning and overdose, and chocking.

Data Collection Process

The questionnaire was converted into a Google Forms document, and the link providing access to the questionnaire in both languages was distributed through the Order of Nurses of Lebanon. This was followed by two reminder messages inviting nurses to complete the survey. The questionnaire was initially sent to 185 school nurses. However, given the very low response rate, researchers had to contact all paid private Lebanese schools to invite their nurses to participate in the study. To obtain the contact information of schools, the researchers utilized the publicly available schools' guide on the website of the Educational Center for Research and Development [16]. This guide provides information on all Lebanese schools, including but not limited to their type (paid private, free private, or public), the governorate where they are located, grades offered, main teaching languages, number of students, and more. Additionally, it includes each school's contact information, such as an email address and phone number. All private schools listed were contacted by the researchers. During the phone call, the researchers requested to speak with the school nurse, if available, to whom they clearly outlined the study's aims and objectives. They explained that participation involved completing an anonymous and confidential self-administered online questionnaire. For those nurses agreeing to take part in the study, the researchers requested their contact information to share the questionnaire link with them. Out of the 891 contacted schools, 221 schools answered, out of which 166 accepted to share the questionnaire with their school nurse, seven schools refused to participate in the study and 48 mentioned not having a school nurse. A total of 86 nurses completed the questionnaire. The data collection process lasted from February 2022 until April 2022.

The researchers adhered to ethical principles throughout the implementation of the study, ensuring that no harm was caused. They respected the confidentiality and anonymity of participants, collecting all data anonymously without posing any questions that might reveal their identity or the school they represent. Additionally, the collected data was securely stored on password-protected computers and will be safely destroyed upon publication of the manuscript. This study was reviewed and approved by the ethics committee at Saint-Joseph University of Beirut (Reference number: USJ-2021-294).

Data Analysis

Descriptive analyses were performed for all variables. Quantitative variables were presented as means and standard deviations (S-D), and categorical variables as frequencies and percentages. The normality of distribution for quantitative variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests.

To assess potential associations of the different variables with the confidence of school nurses in treating medical emergencies, the 5-item Likert scale level of confidence variables were converted into binary variables with "very confident" and "confident" being considered as confident and "neutral", "unconfident" and "very unconfident" being merged as less confident. The independent samples T- test and Chi-square test (or Fisher exact) were used for the bivariate analyses to assess any potential relationship between the confidence level ("confident" versus "less confident") related to each type of emergency and its potential predictors (including nurses' characteristics as well as schools' characteristics and preparedness). A P-value lower than 0.05 was considered statistically significant. Missing values did not exceed 2% of the final dataset, no imputation or replacement was conducted. Data analysis was performed using IBM SPSS Statistics 26 software.

Results

Nurses' Characteristics

A total of 86 nurses participated in the study (Table 1). Eighty-four-point nine percent (84.9%) of the participating nurses were married and 93% had a medium or high SES. Around three-quarters of the participants were registered nurses (73.3%), had more than five years of experience as school nurses (72.1%), and had received basic life support training (76.7%). In addition, 25.5% received advanced cardiac life support training, 16.2% attended pediatric advanced life support and pediatric emergency medicine

training and 16.2% did not receive any of the previously mentioned trainings.

Table 1: Socio-demographic characteristics of nurses (n=86)

Characteristics	n (%)
Marital status	
Single Married Divorced Widowed	9 (10.5)73 (84.9)1 (1.2)3 (3.5)
Age (mean ± SD)	42.1 ± 7.5
Socio-economic status	
LowMedium High	6 (7.0)53 (61.6)27 (31.4)
Highest education level	
Licensed Practical NurseRegistered Nurse Masters None	4 (4.7)63 (73.3)17 (19.8)2 (2.3)
School nurse experience	
≤5 years >5 years	24 (27.9)62 (72.1)
Certification	
Basic life supportAdvanced cardiac life support Pediatric advanced life support Pediatric emergency medicine course None	66 (76.7)22 (25.5)14(16.2)14(16.2)14(16.2)

Schools' Characteristics and Preparedness

Around 84% of the participating school nurses worked in schools with between 251 to 2000 students with most schools (94.2%) reporting more than 10 student visits to the school nurse per week. All represented schools had a nurse present on an average school day and 79.1% had a health provider present during all school hours. Thirty-six percent (36.0%) of participants stated that a MERP was in place for children with life-threatening emergencies, and 96.8% of the nurses mentioned that it was regularly practiced. Around half (53.5%) of the nurses reported having CPR training for their staff in place. More details on schools' characteristics and emergency preparedness are presented in table 2.

Table 2: School Characteristics and Emergency Preparedness (n=86)

Characteristics	n (%)
Number of students	
0–250 251–2,000>2,000	5(5.8)72 (83.7)9 (10.5)
Number of student visits to school nurse per week	
≤10>10	5 (5.8)81 (94.2)
MERP present	
Yes No	31 (36.0)55 (64.0)
Authorized staff identified for medical decision-making	
Yes No	36 (41.9)50 (58.1)
CPR training available	
Yes NoDon't know	46 (53.5)35 (40.7)5 (5.8)
CPR training available for	
TeachersAdministrative staff Students None	42 (48.8)33 (38.3)20 (23.2)5 (5.8)

Nurse available on an average school day	
Yes No	86 (100)0 (0)
School health provider present during all school hours (nurse/MD)	
Yes No	68 (79.1)18 (20.9)
Athletic trainer available during all athletic events	
Yes No	50 (58.1)36 (41.9)
Procedure to contact EMS in place	
Yes No I don't know	61 (70.9)14 (16.3)11 (12.8)
Time needed for EMS to reach the school	
Less than 10minMore than 10min but less than one hour More than one hour	43 (50.6)39 (45.9)3 (3.5)
Time needed to reach the nearest hospital	
Less than 10minMore than 10min but less than one hour More than one hour	63 (74.1)21 (24.7)1 (1.2)

As for the availability of equipment and medications (Figure 1), 61.6% of nurses identified a glucose source for hypoglycemia, 44.1% had an automated external defibrillator and only 19.7% had an epinephrine autoinjector. Moreover, 5.8% of nurses reported having none of the emergency equipment needed to treat life-threatening emergencies. Furthermore, 70.9% of nurses had a procedure to contact EMS but 49.4% of participating nurses reported that in case of emergency, the EMS needed more than ten minutes to arrive. Furthermore, 25.9% of nurses reported needing more than ten minutes to reach the nearest hospital.

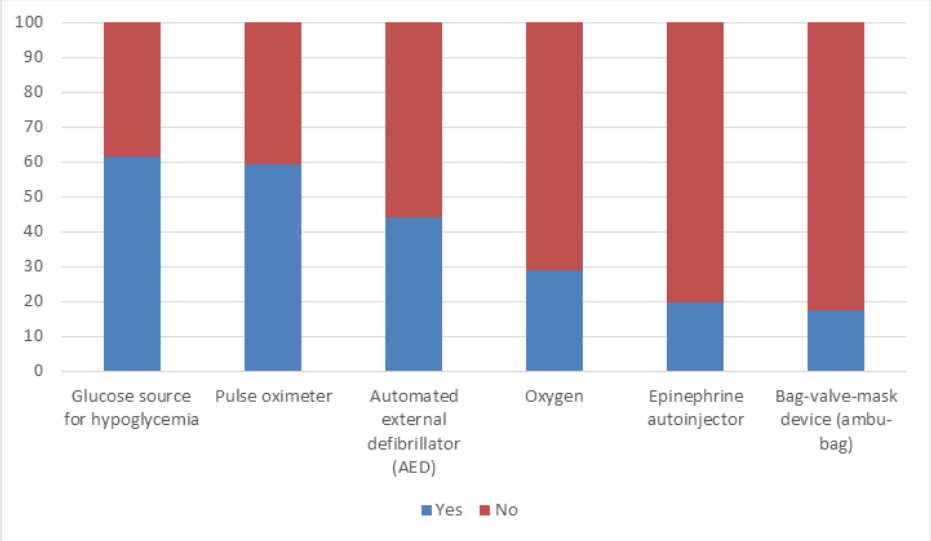

Figure 1: Availability of emergency equipment (n=86)

Confidence in Treating Medical Emergencies

The medical conditions encountered included severe abdominal pain (27.9%), minor sprain/ strain (24.4%), extremity fractures (12.8%), and head and neck injuries (1.6%). Moreover, participating nurses were daily required to manage students with special care such as insulin pumps (68.6%), ventriculoperitoneal shunts (12.9%), gastric tubes (4.6%) and tracheostomy tubes (3.4%).

In terms of their confidence in treating medical emergencies, nurses showed the highest confidence levels for managing bleeding/fractures, and diabetes, and the lowest levels for managing poisoning/overdose and seizure cases (Figure 2).

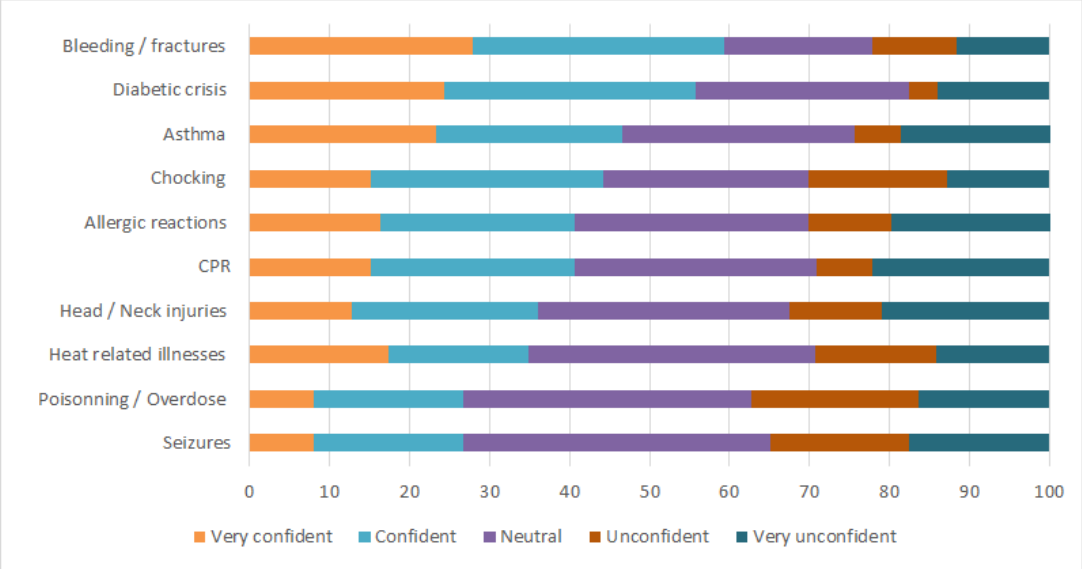

Figure 2: Nurses' confidence levels in treating life-threatening emergencies (n=86)

As for the factors influencing a nurse`s confidence levels in treating life-threatening emergencies, statistically, significant associations were found between the school nurse's experience and confidence levels in treating diabetes, asthma, and allergic reactions:

- Among nurses showing high levels of confidence in managing diabetic emergencies, 81.3% had more than five years of experience and only 18.8% had less than five years of experience (p=0.033).
- Among nurses showing high levels of confidence in managing asthma emergencies, 82.5% had more than five years of experience and only 17.5% had less than five years of experience (p=0.045).
- Among nurses showing high levels of confidence in managing allergic reactions emergencies, 85.7% had more than five years of experience and only 14.3% had less than five years of experience (p=0.019).
- Furthermore, the presence of a MERP was statistically associated with confidence levels in treating heat-related illnesses and asthma:
- Among nurses showing high levels of confidence in managing heat related illnesses emergencies, 60.0% reported having a MERP and 40% reported either not having one or not being aware of its presence (p=0.003).
- Among the nurse's unconfident in being able to treat asthma emergencies, 80.4% reported not having a MERP or not being aware of its presence and only 19.6% had a MERP in place (p=0.003).

Discussions

This study focused on evaluating various crucial factors necessary to address medical emergencies in schools, encompassing both acute and chronic conditions. These factors included the education and experience of school nurses, the presence of essential medication and equipment, and the availability of a MERP. Additionally, the study examined the level of confidence among nurses in handling different types of emergencies commonly encountered in schools. The most frequently reported emergencies included severe abdominal pain, minor sprains, and extremity fractures.

The study findings indicate satisfactory levels of education and training certification among the participating nurses, an aspect that has been recognized by the American Academy of Pediatrics (AAP) as an essential component for delivering quality health services within school environments. Additionally, the characteristics of the sample suggest that the profile of nurses working in private schools aligns with the recommendations set forth by the American Association of School Nurses, which stipulate that a school nurse should hold a registered nurse designation or possess a baccalaureate degree from an accredited college or university [17]. Notably, 73.3% of the participating nurses are registered nurses, 72.1% have over five years of experience, and 83.8% hold advanced life support certification. Moreover, the training certification levels of the participating nurses were relatively higher than those identified in studies conducted in Palestine [18] and Saudi Arabia [19].

Contrary to the satisfactory skills of nurses, evidence suggests there is a concerning shortage of emergency equipment and essential medications in schools, which is necessary for an effective response to health-related emergencies. For instance, only 11.6% of participating nurses reported access to bronchodilator meter-dose inhalers, 19.7% to epinephrine autoinjectors, 29.0% to an oxygen source, and 44.1% to automated external defibrillators (AEDs). These findings – reflecting the shortages in emergency response supplies in Lebanese private schools - mirror the situation of medical supplies availability at the country level. For instance, Lebanon has been witnessing since 2020 shortages in drugs and a huge increase in imported drug prices mainly due to the devaluation of the national currency and the lifting of subsidies on a wide range of medications [20]. However, a separate study conducted in private schools within Saudi Arabia similarly revealed inadequate preparedness concerning the availability of essential supplies for managing medical emergencies. The findings showed that only 26.3% of schools possessed an Epinephrine pen, and a mere 10.5% had an automated external defibrillator [21]. This underscores the overall limited preparedness of schools to effectively respond to medical emergencies in terms of necessary medical supplies. It also highlights the pressing need for increased awareness about these gaps, which expose school students and staff to preventable dangers in the event of a life-threatening health-related emergency.

In addition to the health workforce and medical supplies, preparedness for health-related life-threatening emergencies requires anticipated planning through the development of MERPs which was reinforced by the study findings. For instance, the presence of a MERP was identified in our study as significantly associated with increased confidence levels among nurses when it came to managing particular emergencies, such as asthma and health-related illnesses. However, only 36% of the participating nurses reported the existence of a MERP in their schools, despite its recognized importance. Therefore, schools should consider enhancing their preparedness by establishing and implementing MERPs, ensuring the availability of skilled nurses (and staff with basic life support training including Cardiopulmonary Resuscitation), as well as the necessary equipment to properly manage emergencies.

Regarding school nurses' confidence in addressing health-related emergencies, conflicting outcomes emerged when comparing our study with the one conducted by Olympia et al. in 2005 [14]. For instance, in our study, the highest confidence levels were relative to the treatment of bleeding and fracture (59.3%) and diabetic-related emergencies (55.8%). This is in contrast to the results from Olympia et al., where nurses exhibited the least confidence in addressing these emergencies (25.0% for bleeding and 19.0% for fractures). Moreover, the lowest confidence levels identified through this study were relative to the treatment of poisoning or overdose (26.7%) and chocking (26.7%), whereas nurses displayed high confidence levels in managing these situations (51.0% for poisoning/overdose and 71.0% for choking) in Olympia et al. study. As for the factors affecting the nurses' confidence in treating medical emergencies: (1) increased experience was found to improve nurses' confidence in treating allergic reactions, asthma, and diabetes; and (2) the presence of a MERP was associated with higher levels of confidence in treating health-related illnesses and asthma. The latter emphasizes the essential pillars of good management of health-related emergencies which are a trained and knowledgeable school nurse with an appropriate MERP in place. Lastly, it's important to highlight that our study revealed that over 50.0% of nurses lacked confidence in managing health-related life-threatening emergencies, except for cases involving fractures, bleeding, and diabetic crises. This insight should guide stakeholders, such as the Order of Nurses of Lebanon, towards implementing continuous education programs and organizing training sessions to address these gaps and enhance nurses' knowledge and confidence in handling various emergencies.

Implications for School Health Policy, and Practice

The evidence from the study suggests that there is limited preparedness among private schools, coupled with low confidence levels among nurses in handling health-related life-threatening emergencies. However, avenues for improvement exist. It is imperative to raise national awareness regarding the significance of quality healthcare provision within school premises, particularly as this study solely focused on private schools, potentially skewing perceptions nationally due to the lack of dedicated school nurse positions and adequate resources in public schools. Hence, there is an urgent need for short-term training provisions for all school staff, regardless of their nursing background, in first aid. Furthermore, national-level awareness campaigns are necessary to underscore the importance of preparedness for health-related emergencies, alongside intensified advocacy efforts aimed at recruiting nurses and mandating the presence of a school nurse in all educational institutions, supported by the Ministry of Education and Higher Education. Additionally, providing essential resources such as equipment and medications is crucial for effective preparedness. Moreover, the Order of Nurses of Lebanon is encouraged to develop continuous education programs tailored specifically for school nurses, focusing on enhancing their proficiency in managing common health-related emergencies encountered in school settings.

Limitations

This study has a few potential limitations. First, the size and distribution of the sample could restrict the generalizability of the results and might have impacted the significance of the statistical analyses. In fact, the research team adopted a convenient sampling approach that coupled with the low response rate (51.8%) reduces the generalizability of the findings. However, a probability random sampling approach was not possible due to a lack of data regarding the availability and deployment of school nurses in Lebanese schools. In fact, 22% of the private schools contacted, claimed that they did not have a nurse. Moreover, public schools could not be included in this study since, in Lebanon, they do not have a position for a nurse within their organigram (developed by the Lebanese Ministry of Education and Higher Education) but have instead, a position for a person who provides health education and services, regardless of their educational background. Second, asking about confidence levels in treating or managing medical emergencies rather than evaluating the level of knowledge of nurses on the management of different types of emergencies could have resulted in an information bias. For instance, the study findings are based on the nurses' evaluation of their confidence levels in treating emergencies and might be prone to information and prevarication biases. This may have resulted in an overestimation of confidence levels compared to the actual competence. Nevertheless, the biases related to the sampling approach and the nature of the questions asked imply that the study findings represent an overestimate of the levels of preparedness and readiness of nurses, and the national situation is likely to be worse. Third, the researchers did not assess in this study the level of preparedness of schools to manage natural disasters or emergency situations that put the lives of students and staff in danger. For instance, the country has already experienced several clashes [22], terrorist attacks, and other tragic incidents (such as the Beirut Port explosion in August 2020) as a consequence of political tensions and instability. Therefore, preparedness for such events including mass evacuation, provision of psychological first aid, etc. should also be considered as part of a school's preparedness to manage life-threatening emergencies.

Conclusions

Better health outcomes among school students and staff require well-coordinated and effective emergency response in schools. The study findings highlight the limited preparedness of Lebanese private schools to face health-related emergencies that might occur on their premises. Hence, it is recommended that the Order of Nurses of Lebanon, the Lebanese Pediatric Society, and national committees representing caregivers of students utilize the study findings to advocate for enhanced preparedness regarding medical emergencies in schools. Additionally, these findings serve as valuable insights to inform school directors and policymakers on the needed actions for better preparedness of schools for health-related emergencies.

Lastly, further studies focusing on public schools that are even more vulnerable to the country's political and economic instability, are needed to assess their level of preparedness to face health-related emergencies, identify gaps, if any, and shed light on the needed actions.

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Conflict of Interest Statement

None declared

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