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Maternal knowledge of pediatric first aid in Riyadh

Addressing gaps for improved child safety and women's health outcomes

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Abstract

Childhood injuries are a major cause of morbidity and mortality worldwide, with mothers often being the first responders in such emergencies. In Saudi Arabia, despite high educational attainment, maternal preparedness for pediatric first aid remains underexplored. This study aims to evaluate maternal knowledge, attitudes, and practices (KAP) concerning pediatric first aid in Riyadh, with a focus on identifying key gaps and informing interventions in line with Saudi Arabia's Vision 2030. This descriptive cross-sectional study surveyed 385 mothers residing in Riyadh between May and September 2023. Data were collected through a structured and validated questionnaire available in Arabic and English, distributed via social media platforms. The questionnaire assessed socio-demographic characteristics, knowledge, attitudes, and practices regarding pediatric first aid. Statistical analysis was conducted using SPSS version 23, with descriptive statistics and non-parametric tests (Mann–Whitney *U* and Kruskal–Wallis) employed to analyze group differences. The reliability of the instruments was measured using Cronbach's alpha ($\alpha = 0.867$). The majority of mothers (69.2%) were aged between 20 and 40 years, and 66.1% held a university degree. While 97.4% of the respondents reported being aware of first aid, significant gaps in knowledge were observed. Although 76.8% of the participants knew how to apply pressure to a bleeding wound, only 42.3% correctly identified how to preserve a lost tooth, and just 12.3% knew the appropriate response to seizures. Mothers with formal first aid training had significantly higher knowledge scores ($P < .01$), and education level was a significant predictor of better knowledge ($P < .05$). Social media was the most frequently cited source of information (37.6%), followed by first aid training courses (27.4%). Despite high awareness, this study identifies substantial gaps in maternal knowledge of first aid for pediatric emergencies, particularly in managing specific situations such as seizures and dental injuries. These findings highlight the urgent need for structured first aid training programs tailored to mothers in Riyadh. Incorporating first aid education into Saudi Arabia's public health initiatives, particularly Vision 2030, could significantly improve maternal preparedness and enhance child safety.

Abbreviations: CI = confidence interval, IQR = interquartile range.

Keywords: attitudes, emergency treatment, first aid, knowledge, maternal behavior, pediatric emergency, practice

1. Introduction

Mothers play a pivotal role in child healthcare, serving as the first line of defense in managing childhood injuries and ensuring overall well-being.[1] Globally, accidents involving children – especially in the home – are a major cause of morbidity and disability, with preschool-aged children being particularly vulnerable.[2] Common accidents such as burns, falls, choking, and drowning often occur at home, where mothers are typically the primary caregivers responsible for immediate responses.[3] The effectiveness of these responses can mean the difference between life and death, making maternal first aid knowledge an essential component of child safety.

In Saudi Arabia, unintentional injuries are a leading cause of childhood mortality, yet there remains a significant gap in the understanding of home-related accidents and injury prevention.[4] While emergency visits have increased in recent years, many of these incidents could be mitigated or managed more effectively if caregivers were equipped with better first

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aid skills.[5] In Riyadh, where rapid urbanization and modern healthcare infrastructure coexist with traditional family structures, the need for accessible, reliable first aid education for mothers is particularly urgent.

Despite global emphasis on first aid education, several studies from diverse regions – including the U.S., India, and Egypt – highlight similar challenges in maternal first aid preparedness. For example, research from the United States[6] has shown that while many mothers are aware of first aid basics, knowledge gaps in handling specific emergencies, such as seizures or choking, persist. In India, a study revealed that although maternal awareness of first aid was high, practical application was often lacking due to a reliance on informal sources of information, such as social media.[7] Similarly, in Egypt, first aid knowledge was closely tied to socioeconomic factors, with mothers from lower-income households demonstrating less proficiency in emergency responses.[8] These global examples reflect a widespread issue: awareness of first aid does not always translate into effective action, especially in time-sensitive scenarios.

In Riyadh, where maternal education levels are generally high, it would be expected that mothers possess a strong grasp of first aid principles. However, previous studies conducted in Saudi Arabia have uncovered significant knowledge deficits, particularly in handling complex emergencies like burns, fractures, and diabetic-related incidents.[9,10] These findings highlight a broader need for targeted first aid education that not only covers the basics but also addresses the specific needs of a modern, urban society like Riyadh.

Given these challenges, this study explores maternal knowledge, attitudes, and practices concerning pediatric first aid in Riyadh. It aims to assess how knowledgeable mothers are about first aid for common childhood injuries, examine their attitudes toward administering first aid in emergencies, and understand the factors – such as education level and sources of information – that influence their first aid knowledge and practices.

By identifying these gaps, the study seeks to inform public health initiatives, such as Vision 2030, which emphasizes preventive healthcare and the empowerment of women. Ultimately, the goal is to enhance child safety and well-being through improved maternal preparation.

2. Materials and methods

2.1. Location of the study

The research was conducted in Riyadh, the capital city of the Kingdom of Saudi Arabia. Riyadh, being a central hub of cultural, economic, and healthcare developments, provided a suitable backdrop for this study due to its diverse population and advanced healthcare infrastructure. The city is representative of Saudi Arabia's urban environment, making it ideal for assessing maternal knowledge and practices regarding pediatric first aid. By focusing on different neighborhoods within Riyadh, the study aimed to capture a broad spectrum of socio-demographic backgrounds, ensuring that the findings would reflect the varied experiences of mothers across the city's socio-economic spectrum.

2.2. Study design

This study employed a descriptive cross-sectional design, which is widely used to capture data at a single point in time, providing a snapshot of the population's characteristics. The focus was on mothers aged 18 years and older, including expectant mothers and those who had recently given birth. Eligibility criteria required participants to be residents of various neighborhoods across Riyadh, ensuring geographic diversity within the sample. To maintain consistency and focus, only female participants were included, as they are typically the primary caregivers responsible for pediatric first aid in the household, while male participants were excluded.

This design allowed for the collection of data on maternal knowledge, attitudes, and practices regarding first aid in pediatric settings, ensuring that the sample reflected Riyadh's population diversity. By surveying a broad range of mothers across different socio-economic backgrounds, the study aimed to assess both the general and nuanced understanding of pediatric first aid in this urban environment. Additionally, the cross-sectional nature of the study enabled the efficient collection of data, offering insights into correlations between socio-demographic variables and maternal first aid knowledge.

2.3. Participant demographics

The study involved a cohort of 385 women (n = 385), all of whom were residents of Riyadh, Saudi Arabia. To ensure that the sampled women met the inclusion criteria and represented the target cohort, specific eligibility requirements were set. Participants were required to be mothers aged 18 years or older, including expectant mothers and those who had recently given birth. Additionally, they were required to be the primary caregivers of children, as the study focused on maternal knowledge of pediatric first aid. Mothers who were not residents of Riyadh or did not self-identify as primary caregivers were excluded.

Participants were selected using convenience sampling, a non-probability sampling technique. This method was chosen due to its practicality in reaching a broad and diverse audience through online platforms. The sampling strategy focused on recruiting mothers from various neighborhoods in Riyadh by leveraging social media platforms such as WhatsApp and Telegram. These platforms provided access to a wide range of community groups, parent networks, and other forums frequented by mothers.

The sample size was determined using MedCalc software (www.medcalc.org/index.php) to ensure robust statistical power, with a 5% α error (indicating a 95% confidence level) and a 20% β error (ensuring 80% study power). This calculation was made to balance precision and feasibility, ensuring the sample was large enough to detect significant differences in maternal knowledge and practices related to pediatric first aid, while also being manageable within the study's logistical constraints.

Participants were recruited over a four-month period, from May 2023 to September 2023, ensuring an adequate time frame to capture a representative sample of mothers across different age groups, educational backgrounds, and socio-economic statuses. This approach helped minimize potential biases and ensured that the sample reflected Riyadh's demographic diversity. Additionally, this temporal range reduced the impact of seasonal variations in injury occurrences and healthcare-seeking behaviors, contributing to the study's generalizability.

2.4. Data collection instruments

Data was gathered using a structured and validated questionnaire, available in both Arabic and English to ensure accessibility for all participants. The decision to use 2 language versions was made to accommodate the linguistic diversity of the target population, as some participants were more comfortable responding in Arabic while others preferred English due to their educational background. To ensure the reliability and validity of the questionnaire across both language versions, the questionnaire was developed specifically for this study, addressing maternal knowledge, practices, and attitudes regarding pediatric first aid in the context of Riyadh. Its development was informed by a review of existing literature and consultation with experts in pediatric emergency care and public health.

A rigorous validation process was conducted. This included a translation and back-translation method: the English version

was translated into Arabic by a certified translator fluent in both languages, and the Arabic version was back-translated into English by an independent translator. Discrepancies were resolved through consultation with subject matter experts, ensuring semantic and conceptual equivalence.

The questionnaire was divided into three distinct sections, each addressing a critical aspect of maternal knowledge, practices, and attitudes regarding pediatric first aid. A pilot study was conducted with 30 participants to test the clarity, cultural relevance, and appropriateness of the items in both versions. Based on feedback from the pilot study and expert reviews, minor amendments were made, including rephrasing ambiguous questions, removing unclear terms, and adjusting culturally specific terminology to enhance clarity and relevance. Cronbach's alpha ($\alpha = 0.867$) confirmed the high internal consistency of the items in both versions, ensuring the reliability and validity of the data collected.

Tool I: Maternal Knowledge Assessment – This section included questions designed to collect socio-demographic information about mothers and their children. Additionally, it assessed the mothers' knowledge of first aid practices in response to common home injuries, such as burns, cuts, and choking incidents.

Tool II: Maternal Practices Evaluation – This tool focused on evaluating actual first aid practices. Scores were assigned based on binary responses (1 for correct and 0 for incorrect) to measure the accuracy of the mothers' reported actions in various first aid scenarios. These scores were subsequently used for comparative analysis between different demographic groups.

Tool III: Maternal Attitudes Assessment – This section assessed the participants' attitudes toward first aid using a simplified 3-point scale ("Yes," "No," "Maybe") to capture their willingness to administer first aid, their confidence in their knowledge, and their perceived need for further training. While this format differs from the traditional Likert scale, which measures attitudes on a continuum (e.g., strongly agree to strongly disagree), it was intentionally used to simplify responses for clarity and to reduce response bias. The "Maybe" option allowed respondents to express neutrality or indecision, ensuring a broader range of attitudes could be captured.

2.5. Data collection

The data was collected via a self-administered online survey, strategically distributed across multiple neighborhoods in Riyadh, Saudi Arabia. To ensure geographic diversity, the survey was disseminated through a wide range of neighborhood-specific WhatsApp and Telegram groups, including community networks, kindergartens, parent-teacher associations, and groups representing both affluent urban centers and suburban areas. Additionally, local influencers and community leaders shared the survey link to encourage participation from underrepresented demographics.

Participants were recruited using convenience sampling, and the research team was responsible for data collection. The team designed and distributed the survey link through social media platforms. To enhance the response rate, they collaborated with community leaders and organizations to target specific demographic groups, ensuring inclusivity. This approach enabled the collection of data from a diverse range of mothers across Riyadh.

Popular social media platforms such as WhatsApp and Telegram were used to maximize reach and participation. These platforms facilitated the dissemination of the survey through group chats, enabling direct engagement with mothers. This method was particularly effective in reaching diverse socio-economic groups, ensuring broad representation of participants from different areas of the city.

The decision to employ an online, self-administered survey format was driven by several key considerations. First, it enhanced accessibility, allowing mothers to complete the survey at their convenience, irrespective of time or location. Second, this format reduced costs typically associated with face-to-face data collection methods, making the study more cost-effective. Moreover, the online setting minimized potential data entry errors by automatically recording responses, thereby improving the accuracy of the data collected.

Anonymity and confidentiality measures were emphasized to foster trust and ensure honest responses, particularly on sensitive topics such as maternal practices in pediatric first aid. By maintaining confidentiality, the study fostered a sense of trust among participants, which likely contributed to higher response quality. Overall, the online approach enhanced the efficiency and inclusivity of the research process while broadening the scope of participation to include a diverse cross-section of Riyadh's population.

2.6. Ethical consideration

This study adhered to strict ethical standards to protect the privacy and rights of all participants. The online questionnaire was designed to be completed anonymously, ensuring that no personally identifiable information was collected at any stage. All data gathered was treated with confidentiality and used exclusively for research purposes. Before participating, respondents were provided with comprehensive information regarding the study's objectives, the estimated time required for completion, the identities of the researchers involved, and the procedures for data storage and management. This ensured that participants had a clear understanding of the study before consenting to take part. Consent was obtained digitally, and the process emphasized that participation was entirely voluntary. Participants were informed that they could withdraw from the survey at any time without providing a reason, and only those who fully understood the survey content were included in the final analysis. The absence of any identifiable personal data ensured full compliance with ethical standards, further reinforcing participant trust and the integrity of the research

2.7. Data analysis protocol

Data analysis was performed using SPSS software version 23. Descriptive statistics were used to summarize the characteristics of the study population. Categorical variables were presented as frequencies and percentages to illustrate the distribution of demographic and other categorical data. For continuous variables, means and standard deviations were calculated where applicable to provide an overall summary of the data. Given that the distribution of the total knowledge scores was non-normal, non-parametric statistical tests were employed to compare groups. The Mann–Whitney *U* test was used to compare knowledge scores between 2 independent groups, while the Kruskal–Wallis test was applied for comparisons involving more than 2 groups. These tests allowed for the identification of statistically significant differences in knowledge scores across various demographic categories. Knowledge scores were reported using the median, mean rank, and interquartile range (IQR) to accurately reflect the central tendency and spread of the data. Statistical significance was defined as a P value less than .05. Additionally, scores were assigned based on the number of correct responses in the knowledge assessment, and these total scores were used to conduct further comparisons between different demographic and socio-economic groups.

2.8. Reliability evaluation

The reliability of the data collection tools was assessed using Cronbach's alpha coefficient, calculated through SPSS version 24.

A Cronbach's alpha value of 0.867 was obtained, indicating a high level of internal consistency across the items in the questionnaire. This value suggests that the tools are reliable and produce consistent results when used in similar populations. According to Downing's classification,[11] a reliability coefficient between 0.8 and 0.9 is considered excellent, underscoring the robustness of the tools used in this study. The high reliability coefficient confirms the dependability of the instruments in capturing the intended constructs – namely, maternal knowledge, practices, and attitudes toward pediatric first aid. This ensures that the data collected can be confidently used to draw meaningful conclusions, and the tools are applicable in real-world settings, particularly in diverse urban populations like that of Riyadh

3. Results

These findings demonstrate that while a majority of mothers in Riyadh are aware of basic first aid principles, significant gaps persist in their knowledge regarding specific pediatric emergencies. Influenced by various sociodemographic factors such as education level and previous formal training, the mothers' understanding of first aid remains uneven across different emergency scenarios. The analysis indicates that education level is significantly associated with first aid knowledge, highlighting the critical role of formal education.

3.1. Demographic profile of respondents

The study population comprised 385 mothers. The majority of respondents were aged between 20 and 39 years (69.2%), with 36.0% falling in the 20 to 29 age group and 33.2% in the 30–39 age group. A smaller proportion of respondents were aged 19 or below (3.07%), 40 to 49 years (19.03%), and 50 years or above (7.08%). Additionally, a significant portion of the participants (66.1%) held a university degree. More than half of the respondents (50.9%) identified as housewives, while 38.6% were employed full-time. Most families (53.5%) had between 1 and 3 children. These demographic characteristics are summarized in Table 1.

Additionally, the study explored the types of injuries children experienced in these households. As shown in Figures 1, 44.6% of respondents reported that their child had never been injured. Among those who had experienced injuries, cuts and wounds were the most common (23.2%), followed by burns (10.7%), incidents involving swallowing foreign objects (9.1%), and falls or bone fractures (8.6%). Incidents of drowning and poisoning were much less common, reported by 2.3% and 1.3% of respondents, respectively.

3.2. Awareness and sources of first aid information

An overwhelming majority of respondents (97.4%) reported being aware of first aid. Social media was the leading source of information for 37.6% of mothers, followed by first aid training courses (27.4%), as shown in Table 2.

3.3. Maternal knowledge of first aid

The assessment of maternal first aid knowledge revealed significant gaps in specific areas, as summarized in Table 3. While 76.8% of mothers knew how to apply pressure to a bleeding wound, only 42.3% correctly identified how to preserve a lost tooth. Knowledge about managing seizures and choking was notably lower. For instance, only 12.3% of mothers knew not to open a child's mouth during a seizure, and 31.3% correctly identified the steps to take in case of choking.

Figure 2 reveals that while 53.05% of mothers possess general first aid knowledge, their expertise in specific areas is significantly lower. For example, 49.50% of respondents knew how to manage cuts and wounds, but only 28.67% were knowledgeable about managing falls, and 26.04% understood first aid for bone injuries and diabetes-related incidents. This highlights the critical gaps in specialized first aid knowledge and emphasizes the need for targeted educational programs to address these deficits.

3.4. Factors associated with first aid knowledge

The study explored how sociodemographic factors, such as education level, income, and employment, correlated with first aid knowledge. Using the Kruskal–Wallis test, which is appropriate for non-parametric data, associations between these factors and the median knowledge scores were analyzed.

As depicted in Table 4, higher levels of education were significantly associated with better first aid knowledge ($P < .05$; 95% CI: 12.7–13.3 for higher education, 10.5–11.5 for university graduates). Participants with higher education or those who could read and write scored a median of 13 (95% CI: 12.7–13.3), compared to 11 (95% CI: 10.5–11.5) for participants with elementary or university education.

In contrast, factors such as age and employment status did not exhibit significant associations with first aid knowledge ($P = .54$ and $P = .869$, respectively). Notably, after adjusting the age ranges to ensure mutual exclusivity (e.g., 20–29, 30–39), the results remained consistent, with no significant differences in knowledge scores across age groups.

This analysis highlights the critical role of formal education in improving first aid knowledge and suggests that targeted educational interventions could be particularly beneficial in addressing knowledge gaps.

3.5. Attitudes toward first aid training

As shown in Table 5, most mothers expressed a positive attitude toward first aid preparedness. An overwhelming 93.7% stated that having a first aid kit at home was important, and 94% agreed that mothers should be trained in first aid. Furthermore, 91.6% expressed a willingness to participate in free first aid training if it were offered.

Table 1

Demographic profile of respondents

Variable	n	%
Age		
19 or below	14	3.7
20–29	138	36.0
30–39	127	33.2
40–49	74	19.03
50 or above	30	7.08
Mother's level of education		
Can read and write	3	0.8
Elementary school	10	2.06
Middle school	12	3.01
High school	46	12.0
University graduate	253	66.1
Higher education	59	15.04
Job		
Housewife	195	50.9
Employed (full time)	148	38.6
Employed (part time)	40	10.04
Living income level		
Higher level	61	15.09
Medium level	315	82.2
Low level	7	1.08
Family living location		
Riyadh City (Capital)	367	95.8
Riyadh provinces	16	4.02

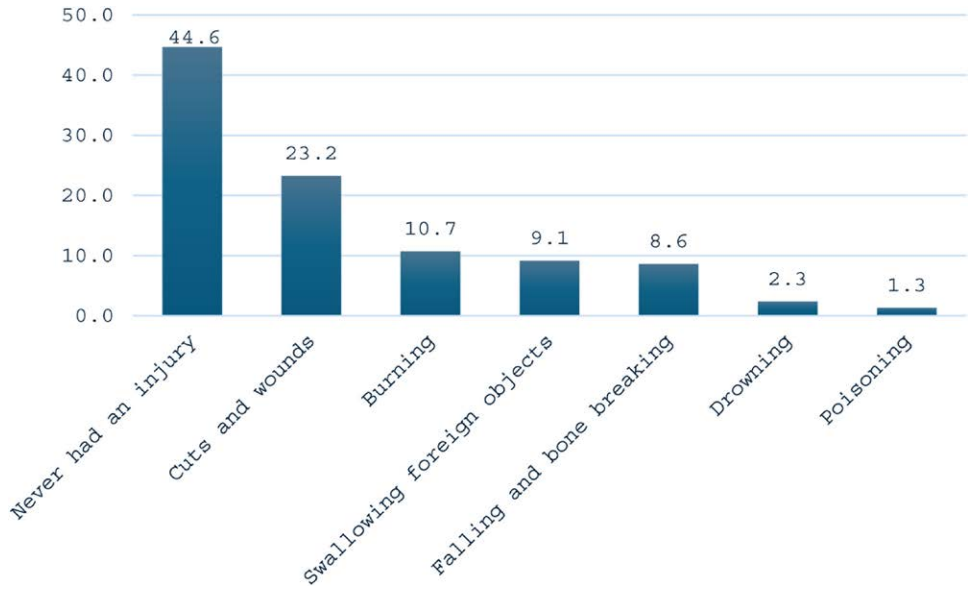

Figure 1. Type of injury that the child was exposed to.

Table 2

Awareness and sources of first aid information

Variable	n	%
Heard about first aid		
Yes	373	97.4
No	10	2.06
Sources of information		
Media (TV, Radio, Podcasts)	62	16.02
Social media (WhatsApp, Twitter, Instagram)	144	37.6
Books	8	2.01
Doctors and nurses	23	6.0
First aid training courses	105	27.04

Table 3

Maternal knowledge of first aid

Incident	Correct knowledge	%
Bleeding wounds (apply pressure)	294	76.8
Lost tooth (preserve in saltwater/milk)	162	42.3
Seizure (avoid opening mouth)	47	12.03
Choking (massage back, raise head)	120	31.03
Burn (place burned part in cold water)	154	40.2
Foreign object in eye (remove with wet cloth)	158	41.3
Foreign object in nose (make child sneeze)	236	61.6

While these findings demonstrate strong positive attitudes, the use of a binary response scale ("Yes," "No") limits the ability to capture the full range of participants' attitudes. A Likert scale could have provided more detailed insights into the intensity of agreement or disagreement. However, the binary approach was intentionally chosen to simplify the survey and reduce participant burden, ensuring higher data completeness. Despite this limitation, the results clearly indicate a widespread Acknowledgments of the importance of first aid training among mothers in Riyadh.

4. Discussion

The study sheds light on the crucial role that maternal first aid knowledge plays in managing pediatric emergencies, particularly within the urban setting of Riyadh, Saudi Arabia. While the study confirms that a significant proportion of mothers are well-educated and highly aware of first aid principles, several knowledge gaps and misconceptions remain prevalent, reflecting similar findings in other studies across different regions.

The demographic analysis revealed that most mothers were between the ages of 20 and 40, with a high percentage holding university degrees. This educated sample should, theoretically, demonstrate strong proficiency in first aid practices. However, the results show a disconnect between education level and first aid knowledge, with substantial gaps in key areas such as managing dental emergencies, choking, and epileptic seizures. While mothers in Riyadh are more likely to have higher knowledge scores than those from other provinces, this does not mitigate the critical knowledge deficits observed. This aligns with studies from Madinah and Makkah, where higher educational attainment did not necessarily equate to comprehensive first aid knowledge.[12,13]

The finding that only 12.3% of mothers were aware of the correct steps to manage a seizure is particularly alarming, as seizures can be life-threatening if not handled appropriately. This gap highlights the persistence of myths and misconceptions around pediatric first aid. In many communities, cultural beliefs about how to respond to a seizure – such as forcing objects into a child's mouth to prevent tongue biting – are still prevalent despite medical evidence to the contrary. Similar misconceptions were observed in studies conducted in Turkey[14] and Nigeria,[15] where incorrect first aid actions for seizures were found to be common. Addressing these misunderstandings through targeted education that specifically dispels such myths is essential to improving emergency responses.

Another gap is the low percentage of mothers who knew the correct procedure for managing dental emergencies, with only 42.3% aware of how to preserve a lost tooth. Dental injuries, though less immediately life-threatening, can have long-term implications for a child's health if not properly managed. Similar knowledge deficits have been reported in studies from Brazil[16] and Malaysia,[17] where first aid for dental trauma was poorly understood by caregivers. Given the importance of timely intervention to preserve avulsed teeth, educational programs should include guidance on managing such incidents, particularly as they are common in childhood due to falls and sports injuries.

The study found that social media was the most common source of first aid information, with 37.6% of respondents

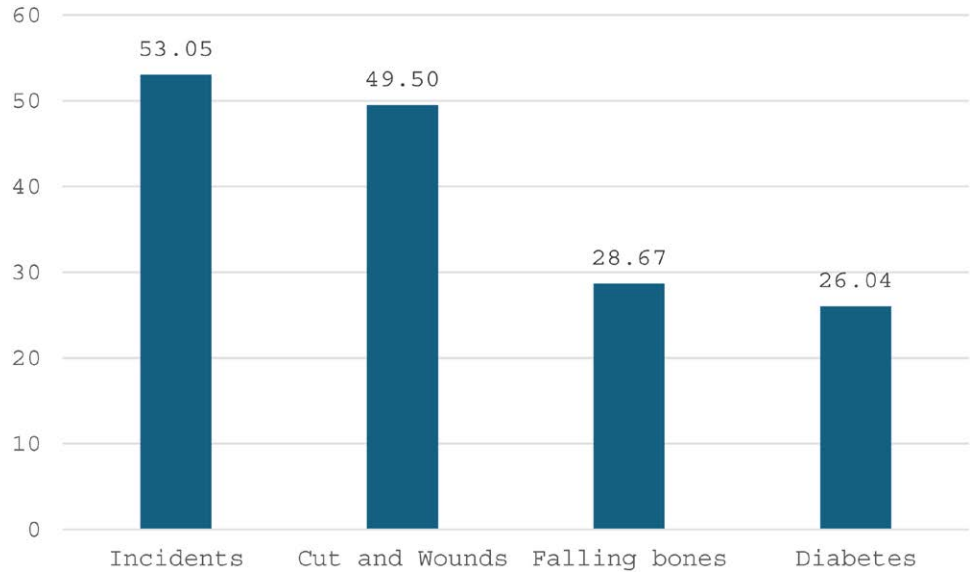

Figure 2. Overall knowledge percent of different items of first aid.

Table 4

Association between sociodemographic factors and first aid knowledge

Variable	Median knowledge score	*P* value	95% CI
Age		.54	
19 or below	12		11.57–12.43
20–29	11		10.73–11.27
30–29	11		10.74–11.26
40–49	12		11.72–12.28
Above 50	12		11.65–12.35
Education level		<.05	
Can read and write	13		
Elementary school	12		
University graduate	11		
Higher education	13		
Job type		.869	
Housewife	11		
Employed (full-time)	11		

Table 5

Attitudes toward first aid training

Attitude	n	%
Importance of first aid kit at home	359	93.7
Mothers should be trained in first aid	360	94.0
Willingness to take free first aid training	351	91.6

relying on platforms such as WhatsApp, Instagram, and Twitter. This trend is consistent with research from other regions, where digital platforms increasingly serve as the primary source of health education.[18,19] However, reliance on informal information channels can lead to gaps in understanding, particularly for more complex first aid scenarios. In contrast, mothers who had received formal training courses demonstrated significantly higher knowledge scores ($P < .01$). This finding supports the argument for structured, professional first aid education, as noted in studies from Middle East.[20]

This study's findings align with global research that highlights similar gaps in first aid knowledge among caregivers. For example, studies in Europe and North America have also identified a need for more structured first aid training, particularly in managing complex emergencies like seizures and diabetic crises.[21–23] In Germany, the implementation of mandatory first aid courses for parents of young children has significantly improved maternal preparedness for pediatric emergencies.[24] These international comparisons reinforce the importance of formalized first aid education programs that can be adapted and localized to suit the specific needs of Riyadh's population.

Moreover, the reliance on social media for first aid knowledge, noted in 37.6% of respondents, raises questions about the quality and reliability of the information being accessed. While digital platforms like WhatsApp, Instagram, and Twitter provide accessible information, they often lack the depth and accuracy needed for more complex first aid scenarios. This issue has been highlighted in research from other regions, such as the United States and the United Kingdom, where unregulated health information on social media has been linked to the spread of medical misinformation.[25,26] Ensuring that mothers have access to reliable, evidence-based first aid information, possibly through official healthcare channels or certified digital resources, is crucial to improving maternal preparedness.

Given the widespread reliance on social media for first aid information, there is a clear opportunity to leverage these platforms more effectively. Partnerships between healthcare organizations and social media companies could ensure the distribution of reliable, evidence-based first aid information. Verified content on platforms like WhatsApp, Instagram, and Twitter could be promoted through official healthcare channels to counter misinformation. By harnessing the power of social media, healthcare providers can reach a wider audience and ensure that accurate first aid practices are shared among mothers in Riyadh and beyond.

Despite 97.4% of mothers being aware of first aid, the knowledge breakdown reveals troubling gaps in certain emergency situations. For example, only 42.3% knew the proper steps for handling a lost tooth, and a mere 12.3% were aware of the correct actions during a seizure, indicating that many mothers still hold misconceptions. This mirrors findings from similar studies conducted in Saudi Arabia and other regions, where common first aid myths, such as forcing a child's mouth open during a seizure, persist.[27,28] Furthermore, only 31.3% correctly identified the appropriate steps for choking. This emphasizes the need for targeted educational interventions to address these specific weaknesses.

Mothers demonstrated strong attitudes towards the importance of first aid preparedness, with 93.7% recognizing the necessity of having a first aid kit and 94.0% believing that mothers should be trained in first aid. These positive attitudes are encouraging, as they reflect a high level of receptiveness to further education. The findings from this study have practical implications for policymakers and healthcare providers in Saudi Arabia. Integrating maternal first aid training into existing maternal health programs could be a critical step forward in enhancing child safety. Policymakers should consider incorporating first aid training as a routine part of prenatal and postnatal care. Additionally, a nationwide public awareness campaign promoting pediatric first aid could further enhance preparedness, especially among mothers with lower education levels or limited access to healthcare facilities. By making first aid education more accessible and part of the healthcare system, Saudi Arabia can align its health policies with the goals outlined in Vision 2030.[29,30] However, concerns about potentially causing harm or lacking confidence in their knowledge were frequently cited barriers. These concerns have been echoed in similar research, particularly in studies focusing on mothers in Makkah and Madinah, where fear of performing first aid incorrectly was identified as a major hindrance to effective emergency response.[12,13]

The positive attitude toward first aid training, with 94% of mothers expressing a desire to receive such an education, is a significant finding that can be leveraged for future interventions. This receptiveness aligns with studies from other regions, such as Australia and Canada, where caregivers have shown a willingness to engage in first aid training when made available.[31,32] Given the increasing prevalence of online learning platforms, the development of accessible, culturally appropriate first aid courses tailored to the needs of mothers in Saudi Arabia could be an effective strategy. These courses should not only provide instruction on common injuries but also address the specific medical conditions prevalent in the region, such as diabetes.

In terms of injury prevalence, cuts and wounds were the most common types of injuries (23.2%), followed by burns (10.7%) and falls (9%). These findings are consistent with patterns observed in other urban environments where children frequently encounter household hazards.[33,34] The high frequency of these injuries underscores the importance of educating mothers on how to handle these common scenarios.

Diabetes-related first aid knowledge was also notably lacking, with only 29.0% of respondents correctly recognizing symptoms of high blood sugar. This is concerning, given the rising rates of childhood diabetes globally. Other studies have also found that maternal knowledge on managing diabetes-related emergencies is often underdeveloped, pointing to a need for more specific training on chronic conditions.[35,36] Tailored educational programs addressing chronic illness management, along with standard first aid protocols, could help close this gap.

Future research should explore the effectiveness of different first aid educational interventions, particularly in maternal populations with varying levels of education. Longitudinal studies could assess the long-term impact of first aid training on maternal preparedness and child health outcomes. Additionally, research focused on understanding the barriers to implementing first aid knowledge in real-life emergencies could provide valuable insights into how best to structure training programs. Investigating the role of cultural beliefs and misconceptions in influencing first aid practices will also be key to developing more tailored and effective educational interventions in Riyadh and similar urban environments.

It is also worth noting the socio-economic implications of the study's findings. Mothers with higher levels of education were more likely to demonstrate better first aid knowledge, a trend that aligns with global patterns observed in healthcare literacy.[37,38] However, this disparity highlights the need for inclusive educational programs that can reach mothers across all socio-economic strata. In regions where access to formal education is limited, community-based programs or collaborations with local healthcare providers may be necessary to ensure that all mothers are equipped with the necessary first aid skills.

Ultimately, while mothers in Riyadh display a high level of first aid awareness, there is still considerable room for improvement in translating that awareness into actionable knowledge. As has been shown in similar studies conducted in Saudi Arabia and beyond, targeted and structured first aid education programs are essential for equipping mothers with the skills they need to manage a variety of emergencies.[39,40] Integrating such programs into existing public health initiatives, like Saudi Arabia's Vision 2030, could significantly enhance maternal preparedness and, by extension, child safety.

5. Limitations

While this study provides valuable insights into maternal knowledge and practices regarding pediatric first aid in Riyadh, several limitations should be acknowledged.

Firstly, the study relied on a self-administered online survey, which may have introduced biases related to technology access and familiarity. Mothers who were more comfortable with digital platforms or had greater access to technology were more likely to participate, potentially excluding those from lower socio-economic backgrounds or with limited digital literacy. This could affect the generalizability of the findings to all mothers in Riyadh, particularly those in less affluent neighborhoods.

Secondly, self-reported data can be prone to recall bias or social desirability bias, where participants may overestimate their knowledge or provide answers they perceive as more acceptable, rather than reflecting their true knowledge or practices. This may have led to an inflated sense of preparedness in the reported data.

Additionally, the cross-sectional design of the study only captures data at a single point in time, preventing the establishment of causal relationships. As the data was collected over a limited timeframe (May to September 2023), seasonal variations in injury types and healthcare-seeking behaviors refer to the fact that certain injuries are more common during specific times of the year. For example, burn injuries might increase during winter due to the use of heaters, while drowning incidents may peak during summer due to outdoor water activities. These temporal trends may influence the types of injuries mothers encounter and, consequently, their first aid practices. Future studies using longitudinal designs would provide more comprehensive insights into how maternal knowledge and practices evolve over time.

Moreover, the study's focus on mothers in Riyadh, while reflective of an urban environment, limits the generalizability of the findings to other regions of Saudi Arabia, particularly rural areas where access to healthcare and educational resources may differ significantly. The urban context of Riyadh may not fully capture the challenges faced by mothers in less resourced or more isolated communities.

Furthermore, the binary response scale ("Yes," "No") used to assess attitudes toward first aid training may have limited the ability to capture nuanced perceptions. While this approach was chosen for simplicity and to reduce participant burden, a Likert scale could have provided more detailed insights into the intensity of agreement or disagreement. Future studies should consider using more sophisticated tools to assess attitudes in greater depth.

The exclusion of fathers and less technologically literate mothers also limits the scope of the study. Fathers may play significant roles in pediatric first aid and emergency care, while mothers who lack digital literacy may represent important perspectives on challenges in first aid training and practices. Their

exclusion potentially skews the findings toward a more digitally savvy and affluent population, reducing the generalizability of the results.

Lastly, the study excluded male caregivers, who may also play significant roles in pediatric first aid. While the focus on mothers was deliberate due to their primary caregiving roles, future research should include fathers or other caregivers to provide a more holistic understanding of family dynamics in emergency situations.

6. Conclusions

This study highlights significant gaps in maternal first aid knowledge in Riyadh, despite high levels of general awareness. While most mothers were familiar with basic first aid concepts, many lacked the skills to handle specific emergencies, such as seizures, choking, and dental injuries. This indicates a need for targeted, scenario-based first aid training to ensure effective emergency responses.

The correlation between higher education and improved first aid knowledge suggests that formal education plays a role, but it is insufficient on its own. Mothers who completed formal first aid training demonstrated higher knowledge levels, underscoring the importance of structured, hands-on training programs. Social media, the primary source of information for many mothers, lacks the depth needed for proper first aid instruction, further supporting the need for authoritative and practical training.

Mothers showed strong interest in further first aid education, presenting a clear opportunity for public health initiatives, including integrating first aid into national programs like Vision 2030. Digital platforms and community workshops could make first aid education more accessible, helping to close the knowledge gaps.

In conclusion, while mothers in Riyadh are aware of first aid, their practical knowledge remains limited. Implementing targeted first aid training, aligned with public health strategies, is essential to improve emergency preparedness and safeguard children's health.

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