


ORIGINAL ARTICLE

Knowledge, attitude, and practice of Saudi teachers regarding their role in anaphylaxis management in Makkah Region, Saudi Arabia

Hanin A. Qashqari^{1*} , Alaa H. Banaser¹, Furat F. Abdulsamad¹, Renad A. Hariri¹, Ertwaa S. Alamri¹, Renad AlJuaid¹, Naif M. Almeqaty²

ABSTRACT

Objective: This study aimed to assess the knowledge, attitude, and practice of Saudi teachers regarding their role in managing anaphylaxis in the Makkah region.

Methods: A descriptive cross-sectional study surveyed 677 teachers from public and private schools in Makkah between 2023 and 2024, utilizing convenience sampling.

Results: The surveyed teachers, aged 23 to 60 years with a mean age of 44.1 ± 11.9 years, comprised 50.7% males. Most held bachelor's degrees (81.7%), with 9.5% had diploma and 8.9% post-graduate degrees. Regarding teaching phases, 36.3% focused on primary, 33.4% on intermediate, and 30.3% on secondary school levels. The majority (59.7%) had over 15 years of teaching experience, while 22.3% had 11-15 years, and 18% had 1-10 years. Findings indicated limited overall knowledge (15.1%) among teachers, with only 17.3% being familiar with epinephrine as a treatment. However, 93.1% believed educational lectures on anaphylaxis were necessary for school staff. Notably, 28.8% of teachers were aware of students suffering from anaphylaxis.

Conclusion: The study underscored a gap in teachers' knowledge and practices concerning anaphylaxis management, despite a positive attitude. Given these insights, targeted interventions are crucial to improving teachers' understanding of anaphylaxis and their role in addressing it effectively.

Keywords: Knowledge, attitude, practice, anaphylaxis, Saudi Arabia.

Introduction

Rapid allergic reactions that are potentially life-threatening are known as anaphylaxis, which is a common medical emergency [1,2]. Anaphylaxis cases have been on the rise over the last ten years [2]. Evidence from recent studies suggested a rise in prevalence on a global level [3]. Hospitalization for anaphylaxis due to food allergies is more common in children under the age of five years [3]. Furthermore, this particular age group experienced a greater surge in anaphylaxis occurrences. A recent cross-sectional study in Saudi Arabia revealed that 46% of anaphylaxis incidents in two emergency departments were attributed to food allergies, with a majority of the patients being under 18 years old [4].

Given the length of time students spend in school each day, school staff need to respond swiftly to administer treatment in the event that an anaphylactic reaction occurs [5,6]. Despite the widespread occurrence among school-

age students, there has been a gap in knowledge among Saudi teachers [7]. A study conducted in Jeddah, Saudi Arabia, found that there was a lack of understanding about food allergies in the general public, indicating the need for more educational efforts [8].

A study was carried out in 2019 in Al-Qaseem City, Saudi Arabia, to investigate the confidence and attitude of teachers toward their role in managing anaphylaxis,

Correspondence to: Hanin Ahmad Qashqari

*College of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia.

Email: ihaneenaq@outlook.com

Full list of author information is available at the end of the article.

Received: 20 March 2024 | **Accepted:** 19 April 2024



revealing that most teachers had limited knowledge of anaphylaxis, and their level of practice was deemed insufficient [9]. Another study encompassing all regions of Saudi Arabia determined that Saudi teachers' awareness and procedures related to anaphylactic responses needed improvement [7]. According to studies, a significant percentage of school children, who never had allergies before would experience their first anaphylactic response while at school [10].

Insufficient training of instructors in managing children's allergies can significantly negatively impact their overall wellness in preschool and school settings. The European Academy of Allergology and Clinical Immunology (EAACI) emphasized the importance of school staff members' knowledge in recognizing allergic reactions in children and providing first aid [11].

In addition to reducing flare-ups, emergency visits, potential hospitalizations, and missed school time, empowering the child and those around them with better self-care and understanding of allergic diseases also enhances the child's participation in extracurricular activities, fosters social connections with peers, and positively impacts family life [5]. Another study stated the increased biphasic response and fatal outcomes at schools were both linked to the delay in diagnosis and therapy [12].

This study aimed to assess Saudi teachers' knowledge, attitude, and practice (KAP) regarding their role in anaphylaxis management in Makkah, Saudi Arabia. The previous research done in the Makkah Region focused on primary schools and the preceding national survey had only 101 participants from the western region. It is believed that it is crucial to have a more accurate representation [7,13].

Subjects and Methods

This was a descriptive cross-sectional study designed to assess the KAP of Saudi teachers regarding their role in anaphylaxis management in the Makkah region. The study was conducted between October 2023 and May 2024. The participants included Saudi teachers at primary, intermediate, and secondary levels in both public and private schools, spanning various cities in the Makkah region. It excluded participants of other nationalities and those not working in teaching roles with school students.

The minimum sample size required for this study was calculated as 383 using OpenEpi version 3.01 at a confidence interval (CI) level of 95%. To ensure a power of at least 80% and to account for incomplete questionnaires, an additional 10%-20% of forms were collected. Consequently, the final number of participants included in the study reached 460.

In this study, a validated Arabic questionnaire, obtained from a previous publication, underwent review by an Arabic language expert before being self-administered. Electronic links, containing the survey's objectives, target population details, and a request for voluntary participation. Survey responses were collected anonymously, ensuring no gathering of identifying

information, and maintained with strict confidentiality, while securely stored on protected devices.

Questionnaires were distributed via social media apps to eligible Saudi teachers in various cities of Makkah region. The teachers were selected by convenience sampling technique. The data that was collected through an online Google Form, included sections on consent forms, sociodemographic data, and assessments of teachers' knowledge, practical understanding, and attitudes toward anaphylaxis. The questionnaire was adapted from Alsuhaibani et al. [9].

The data were analyzed using Statistical Package for Social Sciences version 21 (SPSS: An IBM Company). All statistical methods used were two-tailed with an alpha level of 0.05 considering significance if the *p*-value was less than 0.05. Overall knowledge level regarding anaphylaxis was assessed by summing up discrete scores for different correct knowledge items. The overall knowledge score was categorized as a poor level if the teachers' score was less than 60% of the overall score and a good level of awareness was considered if the teachers' score was 60% or more of the overall score. Descriptive analysis was done by prescribing frequency distribution and percentage for study variables including teacher's personal data, teaching phase, and teaching experience. Also, teachers' knowledge about anaphylaxis and their witness of students with anaphylaxis and its treatment were tabulated while teachers' overall knowledge level and their source of information were graphed. Cross tabulation for showing the distribution of teachers' overall knowledge level by their data and practice was carried out with Pearson chi-square test for significance and exact probability test if there were small frequency distributions.

Results

A total of 677 eligible teachers in Makkah region were included. Teachers' ages ranged from 23 to 60 years with a mean age of 44.1 ± 11.9 years. A total of 343 (50.7%) teachers were males. As for educational level, 553 (81.7%) had bachelor's degrees, 64 (9.5%) had diplomas, and 60 (8.9%) had post-graduate degrees. Around 246 (36.3%) teachers were in the primary phase. A total of 404 (59.7%) teachers had teaching experience exceeding 15 years and 151 (22.3%) had experience of 11-15 years (Table 1).

Around 59.4% of the included teachers were informed about anaphylaxis before, 28.8% of teachers knew students who suffer from anaphylaxis, and 46.5% knew the symptoms of anaphylaxis. Regarding substances causing anaphylaxis, 60.9% of the teachers reported food. The most reported types of food causing anaphylaxis were eggs (75.5%), seafood (68.4%), bananas (56.3%), and nuts (36.6%). Only 8.9% of the study teachers thought that exercise was one of the causes of anaphylaxis. However, 37.4% thought that rubber products were one of the causes of anaphylaxis. A total of 33.2% of participants reported that calling an ambulance is the initial step that should be performed in case of anaphylaxis and only 9.7% reported giving epinephrine injection. Furthermore, 8.4% of teachers knew that epinephrine should be administered

Table 1. Demographic characteristics of Saudi teachers, Makkah region, Saudi Arabia.

| Personal data | Frequency (n) | Percentage (%) |
|---------------------------|---------------|----------------|
| Age in years | | |
| 23-35 | 97 | 14.3 |
| 36-45 | 243 | 35.9 |
| >45 | 337 | 49.8 |
| Gender | | |
| Male | 343 | 50.7 |
| Female | 334 | 49.3 |
| Location of school | | |
| Makkah | 279 | 41.2 |
| Jeddah | 150 | 22.2 |
| Ta'if | 130 | 20.2 |
| Qunfudhah | 106 | 15.7 |
| Other | 12 | 0.7 |
| Educational level | | |
| Diploma | 64 | 9.5 |
| Bachelor degree | 553 | 81.7 |
| Post-graduate | 60 | 8.9 |
| Teaching grade | | |
| Primary | 246 | 36.3 |
| Intermediate | 226 | 33.4 |
| Secondary | 205 | 30.3 |
| Teaching experience years | | |
| 1-10 | 122 | 18.0 |
| 11-15 | 151 | 22.3 |
| >15 | 404 | 59.7 |
| Specialty | | |
| Arabic language | 147 | 21.7 |
| Math | 111 | 16.4 |
| English | 53 | 7.8 |
| Islamic studies | 132 | 19.5 |
| Science | 90 | 13.3 |
| Other | 144 | 21.3 |

subcutaneously but most of them (80.5%) did not know about the route of administration (Table 2).

Figure 1. Overall Knowledge of Saudi teachers regarding their role in anaphylaxis management. A total of 102 (15.1%) of the study teachers had an overall good knowledge of anaphylaxis while most of them (84.9%; 575) had a poor knowledge level (Figure 1).

The most reported sources included the internet and social media (83.1%), followed by a booklet (24.1%), awareness campaigns (12.4%), and seminars (11.7%) (Figure 2).

A total of 117 (17.3%) teachers heard of epinephrine as a drug, 125 (18.5%) heard before about self-injection (Epipen), and 65 (52%) of them knew how to use a self-injection (Epipen). A total of 92 (13.6%) teachers reported that there is an action plan in their school for anaphylaxis, and 73 (10.8%) knew about emergency

medications for anaphylaxis cases that were available in their schools (Table 3).

Exactly 93.1% of the study teachers thought that school staff need education lectures about anaphylaxis, 90.4% thought there should be a plan of action in anaphylaxis cases, and 73.9% thought children with anaphylaxis should wear something that alerts others about their allergy (Table 4).

Exact 18.6% of female teachers had an overall good knowledge level versus 11.7% of males with recorded statistical significance (p -value=0.012). Also, 22.1% of teachers who knew a student with anaphylaxis had an overall good knowledge compared to 12.2% of others (p -value=0.001). Good knowledge about anaphylaxis was detected among 37.1% of teachers who had their information in a booklet versus 20% of others who reported for the patient himself (p -value=0.001). Likewise, a good knowledge level was detected in 28.2% of teachers who heard of epinephrine as a drug, 28.8% of teachers who had heard before about self-injection, and 20.5% of teachers who had emergency medications for anaphylaxis cases available in their school ($p < 0.05$ for all) (Table 5).

The factors including gender, teaching grade, and teachers' knowledge were found to be statistically significant in the multiple stepwise logistic regression. The data indicated that female teachers had 1.5 times more likelihood of good knowledge about anaphylaxis than males (OR = 1.57), teachers in higher teaching grades showed 1.2 times more knowledge of anaphylaxis than others, and those who knew any students who suffer from anaphylaxis showed 1.6 times more knowledge level (OR = 1.66). Also, teachers who thought children with anaphylaxis should wear something that alerts others about their allergy showed 1.3 times more likelihood of good knowledge about anaphylaxis and those who thought school staff need educational lectures about anaphylaxis showed 1.5 times more likelihood than those who did not. The most reported factor was for teachers who were informed about anaphylaxis before as they showed 5 times more likelihood of having good knowledge than for teachers who heard before about self-injection as they had 2.4 times more liability for good knowledge about anaphylaxis (OR = 5.27 and 2.4, respectively) (Table 6).

Discussion

There has been a discernible rise in the occurrence of anaphylaxis, a severe and urgent situation caused by an extreme hypersensitive reaction, in the past ten years [1,2]. In an anaphylactic reaction, school staff must be ready to administer treatment, as children spend a considerable portion of their day at school [5,6]. There is a substantial awareness gap among Saudi instructors about this critical health condition, even though it is more common among school-age children [7]. In this study, Saudi Arabia's Makkah region instructors were assessed. Overall, the data demonstrated a very positive attitude but poor understanding and practice about their involvement in anaphylaxis.

Table 2. Knowledge of Saudi teachers regarding their role in anaphylaxis management in Makkah region, Saudi Arabia.

| Domain | | Items | Frequency (n) | Percentage (%) |
|---|--|-------|---------------|----------------|
| General knowledge | Have you been informed about anaphylaxis before? | | | |
| | Yes | 402 | 59.4 | |
| | No | 275 | 40.6 | |
| | Do you know any students who suffer from anaphylaxis? | | | |
| | Yes | 195 | 28.8 | |
| | No | 482 | 71.2 | |
| | Do you know the symptoms of anaphylaxis? | | | |
| | Yes | 315 | 46.5 | |
| | No | 362 | 53.5 | |
| | What type of substance can cause anaphylaxis? | | | |
| | Pollens | 294 | 43.4 | |
| | Food | 412 | 60.9 | |
| | Mites | 163 | 24.1 | |
| | Medication | 323 | 47.7 | |
| | Close contact with animals | 394 | 58.2 | |
| | What type of food can cause anaphylaxis? | | | |
| | Egg | 511 | 75.5 | |
| | Nuts | 248 | 36.6 | |
| | Bananas | 381 | 56.3 | |
| | Strawberries | 199 | 29.4 | |
| | Seafood | 463 | 68.4 | |
| | Is exercise one of the causes of anaphylaxis? | | | |
| | Yes | 60 | 8.9 | |
| No | 289 | 42.7 | | |
| I don't know | 328 | 48.4 | | |
| Are rubber products one of the causes of anaphylaxis? | | | | |
| Yes | 253 | 37.4 | | |
| No | 55 | 8.1 | | |
| I don't know | 369 | 54.5 | | |
| Treatment knowledge | The initial step that should be performed in case of anaphylaxis | | | |
| | Give epinephrine injection | 66 | 9.7 | |
| | Call ambulance service | 225 | 33.2 | |
| | Tell his/her family to take him to the hospital | 151 | 22.3 | |
| | Antihistamines injection | 38 | 5.6 | |
| | Performed CPR | 11 | 1.6 | |
| | I don't know | 186 | 27.5 | |
| | How should epinephrine be administered? | | | |
| | SC | 57 | 8.4 | |
| | IM | 47 | 6.9 | |
| | IV | 28 | 4.1 | |
| | I don't know | 545 | 80.5 | |

According to the current study data, consistent with the findings of another study, 28.8% of instructors had firsthand knowledge of pupils who had anaphylaxis [7]. On the other hand, according to research by Ercan et al., 52% of instructors could recognize pupils with allergy problems [14]. This discrepancy could be explained by insufficient instruction and an inadequate understanding of anaphylaxis in educational settings. Although, this study confirmed its findings from another study,

indicating that 18.6% of female instructors and 11.7% of male teachers had an excellent overall knowledge level [15].

In terms of emergency response, the study showed that 33.2% of participants believed that the first action to take in cases of anaphylaxis is to call for an ambulance. This finding was consistent with earlier research conducted by Gohal [15].

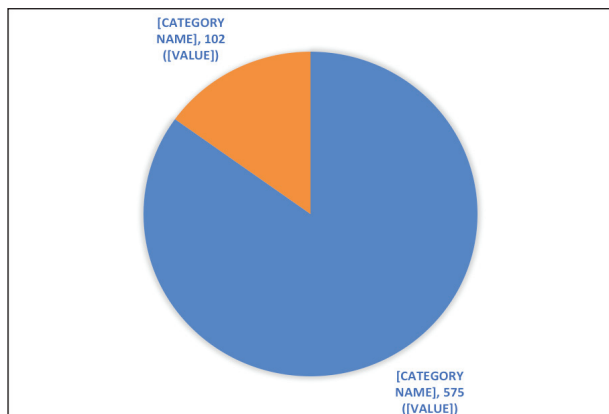


Figure 1. Overall knowledge of Saudi teachers regarding their role in anaphylaxis management.

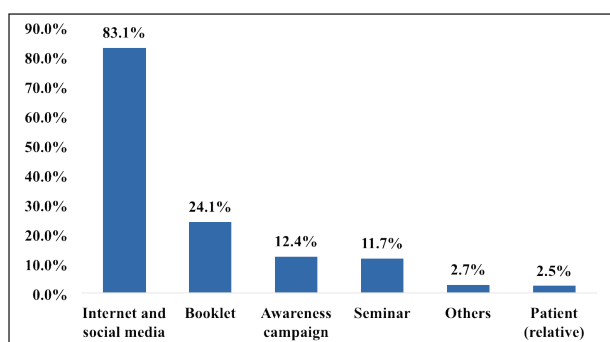


Figure 2. Source of information about anaphylaxis among study teachers.

Table 3. Practice of Saudi teachers regarding their role in anaphylaxis management in Makkah region, Saudi Arabia.

| Teachers' practice | Frequency (N) | Percentage (%) |
|---|---------------|----------------|
| Have you ever heard of epinephrine as a drug? | | |
| Yes | 117 | 17.3 |
| No | 560 | 82.7 |
| Have you ever heard before about self-injection (Epipen)? | | |
| Yes | 125 | 18.5 |
| No | 552 | 81.5 |
| If yes; do you how to use a self-injection (Epipen)? (n = 125) | | |
| Yes | 65 | 52.0 |
| No | 60 | 48.0 |
| In case of anaphylaxis is there an action plan in your school? | | |
| Yes | 92 | 13.6 |
| No | 279 | 41.2 |
| I don't know | 306 | 45.2 |
| Are the emergency medications for anaphylaxis cases available in your school? | | |
| Yes | 73 | 10.8 |
| No | 288 | 42.5 |
| I don't know | 316 | 46.7 |

Table 4. The attitude of Saudi teachers toward their role in anaphylaxis management in Makkah region, Saudi Arabia.

| Attitude | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
|--|-------------------|-----|----------|-----|---------|------|-------|------|----------------|------|
| | N | % | N | % | N | % | N | % | N | % |
| Do you think children with anaphylaxis should wear something that alerts others about their allergy? | 18 | 2.7 | 64 | 9.5 | 95 | 14.0 | 203 | 30.0 | 297 | 43.9 |
| Do you think school staff need educational lectures about anaphylaxis? | 4 | .6 | 9 | 1.3 | 34 | 5.0 | 210 | 31.0 | 420 | 62.0 |
| Do you think there should be a plan of action in anaphylaxis cases? | 4 | .6 | 10 | 1.5 | 51 | 7.5 | 226 | 33.4 | 386 | 57.0 |

Regarding the practice of managing anaphylaxis, the study revealed that 42.5% of teachers stated that their school did not possess emergency medication for anaphylaxis cases, while 46.7% remained unaware of the availability of such medication. This outcome was consistent with the findings of previous research conducted by Asiri et al. [7] and Alsuhaibani et al. [9]. The current study revealed a significant lack of Epi-pen familiarity among teachers, with only 9.7% expressing a willingness to administer epinephrine, aligning consistently with studies conducted in different regions of Saudi Arabia [7,16].

The study involved a substantial and diverse sample of 677 qualified Saudi teachers across various school

levels and types in the Makkah region, enhancing the generalizability of the findings. Multiple demographic variables, including gender, age, education level, teaching experience, and student types, were considered, allowing for a comprehensive examination of their potential impact on teachers' knowledge and attitudes. The research employed a thorough evaluation of teachers' understanding of anaphylaxis, covering aspects such as awareness, symptoms, causes, and management. This detailed approach facilitated a nuanced analysis of knowledge gaps among teachers. The collective evidence underscores a pervasive trend across educational contexts within Saudi Arabia, emphasizing the need for target interventions to increase teachers' understanding

Table 5. Factors associated with teacher’s knowledge about anaphylaxis management in the Makkah Region.

| Factors | Overall knowledge level | | | | p-value |
|---|-------------------------|------|------|------|--------------------|
| | Poor | | Good | | |
| | N | % | N | % | |
| Age in years | | | | | .353 |
| 23-35 | 78 | 80.4 | 19 | 19.6 | |
| 36-45 | 206 | 84.8 | 37 | 15.2 | |
| >45 | 291 | 86.4 | 46 | 13.6 | |
| Gender | | | | | .012* |
| Male | 303 | 88.3 | 40 | 11.7 | |
| Female | 272 | 81.4 | 62 | 18.6 | |
| Educational level | | | | | .230 [§] |
| Diploma | 59 | 92.2 | 5 | 7.8 | |
| Bachelor degree | 466 | 84.3 | 87 | 15.7 | |
| Post-graduate | 50 | 83.3 | 10 | 16.7 | |
| Teaching grade | | | | | .089 |
| Primary | 218 | 88.6 | 28 | 11.4 | |
| Intermediate | 184 | 81.4 | 42 | 18.6 | |
| Secondary | 173 | 84.4 | 32 | 15.6 | |
| Teaching experience years | | | | | .260 |
| 1-10 | 98 | 80.3 | 24 | 19.7 | |
| 11-15 | 128 | 84.8 | 23 | 15.2 | |
| >15 | 349 | 86.4 | 55 | 13.6 | |
| Do you know any students who suffer from anaphylaxis? | | | | | .001* |
| Yes | 152 | 77.9 | 43 | 22.1 | |
| No | 423 | 87.8 | 59 | 12.2 | |
| Source of information | | | | | .001* [§] |
| Booklet | 61 | 62.9 | 36 | 37.1 | |
| Internet and social media | 254 | 76.0 | 80 | 24.0 | |
| Awareness campaign | 36 | 72.0 | 14 | 28.0 | |
| Seminar | 30 | 63.8 | 17 | 36.2 | |
| Patient (relative) | 8 | 80.0 | 2 | 20.0 | |
| Others | 8 | 72.7 | 3 | 27.3 | |
| Have you ever heard of epinephrine as a drug? | | | | | .001* |
| Yes | 84 | 71.8 | 33 | 28.2 | |
| No | 491 | 87.7 | 69 | 12.3 | |
| Have you ever heard before about self-injection (Epipen)? | | | | | .001* |
| Yes | 89 | 71.2 | 36 | 28.8 | |
| No | 486 | 88.0 | 66 | 12.0 | |
| In case of anaphylaxis is there an action plan in your school? | | | | | .092 |
| Yes | 76 | 82.6 | 16 | 17.4 | |
| No | 229 | 82.1 | 50 | 17.9 | |
| I don't know | 270 | 88.2 | 36 | 11.8 | |
| Are the emergency medications for anaphylaxis cases available in your school? | | | | | .022* |
| Yes | 58 | 79.5 | 15 | 20.5 | |
| No | 236 | 81.9 | 52 | 18.1 | |
| I don't know | 281 | 88.9 | 35 | 11.1 | |

P: Pearson X² test §: Exact probability test *p < 0.05 (significant)

of anaphylaxis, including the implementation of educational initiatives that specifically address awareness of the condition, its symptoms, and suitable management techniques alongside a thorough instruction on the administration of epinephrine.

The study was susceptible to recall bias and potential over or underestimation of KAP levels due to reliance on self-reported data. Additionally, the online format might introduce selection/recruitment bias, impacting sample representativeness and limiting the generalizability of

Table 6. Multiple stepwise logistic regression model for predictors of teachers' knowledge about anaphylaxis.

| Factors | p-value | AOR | 95% CI | |
|--|---------|------|--------|-------|
| | | | Lower | Upper |
| Gender | 0.048* | 1.57 | 1.10 | 2.50 |
| Teaching grade | 0.049* | 1.25 | 1.05 | 1.65 |
| Have you been informed about anaphylaxis before? | 0.001* | 5.27 | 2.78 | 9.98 |
| Do you know any students who suffer from anaphylaxis? | 0.034* | 1.66 | 1.04 | 2.64 |
| Have you ever heard before about self-injection (Epipen)? | 0.001* | 2.40 | 1.46 | 3.96 |
| Do you think children with anaphylaxis should wear something that alerts others about their allergy? | 0.020* | 1.37 | 1.05 | 1.78 |
| Do you think school staff need educational lectures about anaphylaxis? | 0.050* | 1.54 | 1.00 | 2.45 |

AOR: Adjusted odds ratio CI: Confidence interval * $p < 0.05$ (significant)

findings to all school teachers. The focus on one region and incomplete representation of cities in the Makkah region due to challenges in reaching developmental cities could affect the study's reliability. Expanding the study to include other regions in Saudi Arabia could yield more robust results.

Future research is required to examine the long-term efficacy of various educational programs in addition to studies that gather data from the Western region.

Conclusion

This study indicated that teachers lack significant knowledge and practice regarding their role in managing anaphylaxis. However, the study found that teachers generally hold a positive attitude. Based on these findings, it is imperative to implement targeted interventions aimed at enhancing teachers' understanding of anaphylaxis.

Acknowledgment

The authors would like to acknowledge the contributions of several individuals who played a pivotal role in data collection, as well as the participants who responded to the study questionnaire. Additionally, the authors would like to thank Umm Al-Qura University (UQU) for giving the ethical approval to conduct this study.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Funding

None.

Consent to participate

Informed consent was obtained from all the participants.

Ethical approval

This study was approved by the Biomedical Research Ethics Committee of Umm Al-Qura University, Saudi Arabia (Approval Number: HAPO-02-K-012-2023-09-1744). Date: 20-09-2023.

Author details

Hanin A. Qashqari¹, Alaa H. Banaser¹, Furat F. Abdulsamad¹, Renad A. Hariri¹, Ertwaa S. Alamri¹, Renad AlJuaid¹, Naif M. Almeqaty²

1. College of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia
2. Pediatric Emergency Department, Maternity and Children Hospital, Makkah, Saudi Arabia

References

1. Bălan H, Gurghean A. Anaphylactic shock: Are we doing enough and with the right timing and order? Rom J Intern Med. 2015;53(3):191–8. <https://doi.org/10.1515/rjim-2015-0026>
2. Alqahtani A, Alanazy H, Saud O, Aljameel H, Saleh F, Aldhawi M, et al. Evaluation of diagnosis and management of anaphylactic shock in emergency room: a literature review. Int J Pharm Res Allied Sci. 2020;(1):93–8.
3. Koplin JJ, Martin PE, Allen KJ. An update on the epidemiology of anaphylaxis in children and adults. Curr Opin Allergy Clin Immunol. 2011;11(5):492–6. <https://doi.org/10.1097/ACI.0b013e32834a41a1>
4. Alkanhal R, Alhoshan I, Aldakhil S, Alromaih N, Alharthy N, Salam M, et al. Prevalence triggers and clinical severity associated with anaphylaxis at a tertiary care facility in Saudi Arabia. Medicine. 2018;97(31):e11582. <https://doi.org/10.1097/MD.00000000000011582>
5. Urrutia-Pereira M, Mocellin LP, de Oliveira RB, Simon L, Lessa L, Solé D. Knowledge on asthma, food allergies, and anaphylaxis: assessment of elementary school teachers, parents/caregivers of asthmatic children, and university students in Uruguiana, in the state of Rio Grande do Sul, Brazil. Allergologia et Immunopathologia. 2018;46(5):421–30. <https://doi.org/10.1016/j.aller.2017.09.018>
6. Rodríguez Ferran L, Gómez Tornero N, Cortés Álvarez N, Thorndike Piedra F. Anaphylaxis at school. Are we prepared? Could we improve? Allergologia et Immunopathologia (Madr). 2020;48(4):384–9. <https://doi.org/10.1016/j.aller.2019.10.006>
7. Asiri KA, Esam Mahmood S, Alostath SA, Alshammari MD, Ahmed T, Sayari A, et al. Knowledge and practices regarding anaphylaxis management in children and adolescents among teachers in KSA. Int J Health Clin Res. 2021;4(2):56–60.
8. Takrouni AA, Omer I, Alasmari F, Islamuldeen S, Ghazzawi AY, Zahrani MI, et al. Knowledge gaps in food allergy among the general public in Jeddah, Saudi Arabia: Insights based on the Chicago food allergy research survey. Front Allergy. 2022;3:e1002694. <https://doi.org/10.3389/falgy.2022.1002694>

9. Alsuhaibani M, Alharbi S, Alonazy S, Almozeri M, Almutairi M, Alaqeel A. Saudi teachers' confidence and attitude about their role in anaphylaxis management. *J Fam Med Prim Care*. 2019;8(9):2975–82. https://doi.org/10.4103/jfmpc.jfmpc_562_19
10. Tsuang A, Wang J. Childcare and school management issues in food allergy. *Current Allergy Asthma Rep*. 2016;16(83):1–6. <https://doi.org/10.1007/s11882-016-0663-0>
11. Devetak I, Devetak SP, Vesel T. Future teachers' attitudes and knowledge regarding the management of the potential students' life-threatening allergic reactions in Slovenian schools. *Slov J Public Health*. 2018;57(3):124–32. <https://doi.org/10.2478/sjph-2018-0016>
12. Tsuang A, Demain H, Patrick K, Pistiner M, Wang J. Epinephrine use and training in schools for food-induced anaphylaxis among non-nursing staff. *J Allergy Clin Immunol Pract*. 2017;5(5):1418–20.e3. <https://doi.org/10.1016/j.jaip.2017.04.014>
13. Alzahrani L, Hadeel A, Alghamdi H, Melebary R, Badahdah SN, Melebary R, et al. Food allergy: knowledge and attitude of primary school teachers in Makkah Region, Saudi Arabia. *Cureus*. 2023;15(9):e45203. <https://doi.org/10.7759/cureus.45203>
14. Ercan H, Ozen A, Karatepe H, Berber M, Cengizlier R. Primary school teachers' knowledge about and attitudes toward anaphylaxis. *Pediatr Allergy and Immunol*. 2012;23(5):428–32. <https://doi.org/10.1111/j.1399-3038.2012.01307.x>
15. Gohal G. Food allergy knowledge and attitudes among school teachers in Jazan, Saudi Arabia. *Open Allergy J*. 2018;9(1):1–7. <https://doi.org/10.2174/1874838401809010001>
16. Alomran H, Alhassan M, Alqahtani A, Aldosari S, Alhajri O, Alrshidi K. The right attitude is not enough: assessment of knowledge, attitude, and practice of primary school teachers regarding food allergy in Al-Kharj, Saudi Arabia. *Res Sq*. 2022. <https://doi.org/10.21203/rs.3.rs-1926922/v1>