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ORIGINAL RESEARCH

Knowledge and Attitude of Community Pharmacists Toward Cow Milk Protein Allergy Complications and Treatment in Children: A Cross-Sectional Study in Sudan

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Background: Cow's milk protein allergy is the most frequent type of food allergy in newborns and young children. It affects numerous body systems. A community pharmacist possessing adequate knowledge and appropriate practices is crucial for the management of the disease.

Objectives: : This study aimed to assess the knowledge and attitude of community pharmacists toward the complications and treatment of cow milk protein allergy.

Methods: A descriptive cross-sectional study was conducted among 332 randomly selected community pharmacists in the Capital of Sudan (Khartoum state). Data were collected using a validated and internally consistent (Cronbach Alpha = 0.712) self-administered questionnaire Descriptive statistics and Chi-square analysis were conducted using Statistical Package for the Social Sciences version 25.

Results: The response rate was 95.8%, and about 47.8% of the population had 1–5 years of experience as community pharmacists, and 37.4% of them had a post-graduate degree. Only 30.8% of respondents had good knowledge, while 40.6% had poor knowledge, and 28.6% had scored as having fair knowledge of complications of Cow's milk protein allergy. Regarding knowledge toward treatment, 65.1% of respondents had a poor knowledge, 24.5% had fair knowledge, and only 10.4% had good knowledge. Overall, 39.62% of participants had a positive attitude, and 60.38% had a negative attitude toward this disease. Data analysis showed no significant association between the sociodemographic characteristics of respondents and their knowledge and attitude.

Conclusion: Community pharmacists in Khartoum State had inadequate knowledge and attitude about the complications and treatment of cow milk protein allergy. As a result, we recommend the implementation of strategies to raise pharmacists' knowledge and attitude.

Keywords: community pharmacist, cow milk protein allergy, knowledge, attitude, Sudan

Introduction

Food allergy has become one of the most serious health problems in the globe in the last two decades. The most frequent type of food allergy in newborns and young children is cow milk protein allergy (CMPA).[1] The estimated worldwide prevalence of CMPA in children is between 1.9% and 4.9%.[2] Similarly, in the Middle East and North Africa area, the prevalence of CMPA is estimated to be between 1% and 5%.[3]

CMPA is an immune-mediated adverse reaction to one or more cow's milk proteins, most commonly casein or serum whey (lactoglobulin and albumin).[4] Based on immune responses, CMPA can be categorized into; non-immunoglobulin E (IgE)-mediated CMPA, IgE-mediated CMPA, and mixed CMPA.[5] CMPA frequently affects several systems and takes different forms. The most common CMPA symptoms are constipation, vomiting, diarrhea, and bloody stools. Severe cases have been observed to have urticaria, atopic dermatitis, lip or eyelid edema, and respiratory symptoms such as

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chronic cough, bronchospasm, runny nose, and recurrent otitis media. Moreover, children with CMPA are more likely to suffer from other food allergies, the most frequent of which is egg protein allergy.[6]

CMPA has a negative impact on children health and quality of life, as well as his parents.[7] Children with CMPA face the challenge of limited dietary options, which consequently put them at risk of nutritional deficiencies. Furthermore, it can be challenging for children with CMPA to avoid foods containing milk, particularly in social situations, which can cause them to feel anxious. It can be difficult for parents to control their child's CMPA, as it necessitates ongoing awareness to food choices and may cause financial pressure on their families.[8]

The recommended treatment for CMPA is to avoid all products containing milk by all means. After a successful challenge, CMP is reintroduced when tolerated.[9] Babies with CMPA are unable to drink cow's milk and require amino acid-based formula (AAF) or substantially extensively hydrolyzed casein formula (EHCF). In the case of a breastfed newborn, European standards recommend removing cow milk from the mother's diet for up to four weeks as the initial step in treatment. This necessitates removing the suspected problematic antigens from the maternal diet, which might be difficult to identify. It's challenging to maintain the diet with children, and many moms experience it as well. Allergy to other proteins, fruits, and vegetables is associated with CMPA. Some pharmaceutical additives, including fruit flavoring agents, casein, gluten, and soy, can adversely affect allergic children.[10] Therefore, parents require guidance on the appropriate diet and pharmaceuticals.

In Sudan, including Khartoum State, there is a lack of satisfactory public health care centers, and most people in need has limited access to it. The decentralization of the public sector impaired the primary health care system.[11] Community pharmacists are the first point of contact due to their wide distribution and free accessibility. Therefore, their good patient counseling is the cornerstone for accomplishing the desired therapeutic and patient outcome. In the past decade, the role of the community pharmacist has shifted from being a medication specialist to one that is patient-centered.[12] He can facilitate identifying a child with CMPA by recommending the referral of suspected children for further investigation. Moreover, community pharmacists can offer counseling to caregivers about management plans, hypoallergenic brands of medications and dietary supplements.[13] Since the community pharmacists can play a vital role in CMPA patient diagnosis and outcome, they should be aware of CMPA, and the needs of children and breastfeeding mothers during the period of treatment. Moreover, exploring the knowledge and practices of community pharmacists is crucial to identify any educational gaps and choosing where to focus efforts. However, no published studies are exploring the knowledge and attitude of community Pharmacists toward CMPA. Therefore, the objective of this study was to assess the knowledge and attitudes of community pharmacists about complications and treatment of CMPA in Khartoum State (Sudan).

Methods

Study Design and Setting

A descriptive cross-sectional study was conducted across Khartoum state. It includes the cities of Omdurman, North Khartoum, as well as Khartoum city, the capital of Sudan. Khartoum state covers about 28,000 square kilometers and is home to almost 20% of Sudan's population. The study was conducted from April to October 2022.

Study Population

The study population were licensed pharmacists in Khartoum state. The study included pharmacists working in community pharmacies in different Khartoum state localities. The study excluded community pharmacists who were not working during the study period.

Sample Size and Sampling

The sample size was calculated using "Survey Systems", a sample size calculation software with a 95% confidence level and 5% margin of error. The list of community pharmacies in Khartoum state used in this study was obtained from The Sudanese General Directorate of Pharmacy. Based on the accessible study population (n=2432), and assuming that there is one pharmacist in each pharmacy. The minimum sample size required for this study is 332 participants.

The selection of participants was done by stratified sampling. Each of the seven localities of Khartoum state was considered as strata, then a sample size proportional to stratum size was obtained separately from each stratum using simple random sampling (Khartoum locality:78, Jabbal Awleaa locality:49, Omdurman locality:43, pharmacies in Karari locality:36, Ombaddah locality:36, Sharg Alneel locality:45, and Bahri locality:45).

Data Collection

Data were collected using a specially designed and validated self-administered questionnaire. It was designed after a critical review of literature relevant to CMPA, and extensive observations from a group of 50 mothers of children allergic to milk protein in Khartoum State. The questionnaire consisted of three sections and comprised a total of twenty questions. Section one explored the socio-demographic characteristics of participants (graduation year, years of experience, and post-graduation studies). The second section consisted of 11 questions assessing the knowledge of participants regarding complications and treatment of CMPA. The third section consisted of nine questions about the attitude of community pharmacists toward CMPA.

To ensure content validity, the questionnaire was reviewed by three consultant pediatricians with expertise in the CMPA and research. Furthermore, to ensure clarity and appropriateness of the questions, the questionnaire was pre-tested on 20 individuals and modified as necessary. The pretest data were excluded from the final analysis. The questionnaire showed acceptable internal consistency (Cronbach Alpha = 0.712). A pharmacist in each randomly selected pharmacy was requested to fill out the questionnaire by responding to the Google-based questionnaire.

Assessment of knowledge and attitude was conducted using a scoring system. Regarding the knowledge section, each correct response received one point, whereas an incorrect answer or "I do not know" received zero points. The overall knowledge score can range from 0 to 7 for CMPA complications, and from 0 to 4 for CMPA treatment. The cut-off scores were; less than or equal to 3 points (poor), 4–5 points (moderate), and 5–7 points (good) for knowledge about complications of CMPA, and 0 −1 point (poor), 2–3 points (moderate), and 3–4 points (good) knowledge toward treatment of CMPA. The attitude section is represented by a 5-range Likert scale, "Strongly agree" received five points for positive statements, and "strongly disagree" received five points for negative ones. A value nearer 5 denoted a more positive attitude, and vice versa. The overall attitude score can range from 0 to 45 points, and the median was used as the cut-off score; respondents' attitudes were categorized as 'Positive' when the score is more than 23 or 'Negative' when it's equal to or less than 23.

Data Analysis

Data were imported to the Statistical Package for the Social Sciences (SPSS ver. 25, IBM Inc, Chicago, IL). Descriptive statistics were carried and the results were presented in the form of tables. Inferential statistics (Chi-square test) was used to describe the associations between dependent and independent variables. P-values of 0.05 or less were considered statistically significant.

Ethical Consideration

The study was carried out by the Declaration of Helsinki's guidelines. The research proposal was approved by the Faculty of Pharmacy Research Ethics Committee, University of Khartoum (FPEC-05-2022), and Khartoum State Ministry of Health of research department (KMOH-RIC-018-4-2022). The purposes of the study were explained to the participants in clear, and simple words, and informed consent was obtained from each participant. Participation is voluntary and participants have the option to withdraw at any time without penalty. The privacy of participants and confidentiality of data was maintained.

Results

Sociodemographic Information of Respondents

The response rate was 95.8% (318/332). About 47.8% of the respondents had 1–5 years of experience as community pharmacists, and 37.4% of them had post-graduate degrees. The characteristics of the respondent community pharmacists are summarized in Table 1.

Table 1 Socio-Demographic Characteristics of Respondents (N: 332)

Variable	Number	Percentage
Experience as a community pharmacist		
Less than 1 year	47	14.8%
1–5 years	152	47.8%
6–10 years	77	24.2%
11–15 years	22	6.9%
More than 15 years	20	6.3%
Post-graduation study		
Yes	119	37.4%
No	199	62.6%

Knowledge of Respondents Toward Complications and Treatment of CMPA

Regarding the overall knowledge of respondents toward CMPA complications, 40.6% had poor knowledge, 28.6% were scored as having fair knowledge, and 30.8% had good knowledge. As shown in Table 2. Most respondents (74%) knew that CMPA is a life-threatening condition, and 59.7% of them knew that CMPA is associated with other protein allergies.

Table 2 Knowledge of Respondents Toward Complications of Cow Milk Protein Allergy

Knowledge of Complications of CMPA	Yes	No	I do not know
	Frequency (%)	Frequency (%)	Frequency (%)
Cow's milk protein allergy (CMPA) can be a life-threatening condition.	236 (74.2%)*	33 (10.4%)	49 (15.4%)
CMPA is associated with multiple protein allergies. (eg Gluten, soy, meat, and egg allergies).	190 (59.7%)*	61 (19.2%)	67 (21.1%)
CMPA has been associated with various food allergies. (eg allergy to some fruits and vegetables).	114 (35.8%)*	104 (32.7%)	100 (31.4%)
Allergic children are deficient in calcium and iron.	164 (51.6%)*	71 (22.3%)	83 (26.1%)
CMPA can cause the following repeated symptoms that do not respond to medicines:			
Constipation	146 (45.9%)*	98 (30.8%)	74 (23.3%)
Diarrhea	260 (81.8%)*	24 (7.5%)	34 (10.7%)
Tremor	73 (23%)	79 (24.8%)*	166 (52.2%)
Reflux	174 (54.7%) *	41 (12.9%)	103 (32.4%)
Visual disturbances	67 (21.1%)	86 (27%)*	165 (51.9%)
Bloody stool	98 (30.8%)*	97 (30.5%)	123 (38.7%)
g) Headache	129 (40.6%)	66 (20.8%)*	123 (38.7%)
Shortness of breath	184 (57.9%)*	53 (16.7%)	81 (25.5%)
Eczema	189 (59.4%)*	43 (13.5%)	86 (27%)
Irritability and persistent crying in infants	256 (80.5%)*	15 (4.7%)	47 (14.8%)
The severity of symptoms varies among children, ranging from mild to severe, requiring hospitalization.	275 (86.5%)*	22 (6.9%)	21 (6.6%)
If there is no diet control, symptoms might become more severe.	295 (92.8%)*	5 (1.6%)	18 (5.7%)

Notes: *The correct response.

Only 30.8% of them knew that bloody stool was one of the symptoms of CMPA. Approximately 81.8% of the participants knew that CMPA can cause diarrhea that does not respond to medicines, and 92.8% of them were aware that symptoms could worsen if food control was not applied.

Regarding the knowledge of respondents toward CMPA treatment, 65.1% had a poor knowledge, 24.5% had fair knowledge, and only 10.4% had good knowledge. Table 3 demonstrates the knowledge of community pharmacists toward CMPA treatment. Out of all the participants, 39.6% of respondents know that allergen elimination from a child's or a nursing mother's food is the first step in treatment, and only 24.8% knew that hydrolyzed casein formula (EHCF) or Amino Acid formula (AAF) is the formulations can be used for a child with CMPA. Approximately 21.7% of respondents are aware that certain types of shampoos, soaps, and body creams are additional prohibited products for allergic children.

The Attitude of Respondents Toward CMPA

In total, 39.62% of participants showed a positive attitude, and 60.38% showed a negative attitude toward CMPA. Table 4 demonstrates the attitude of participants toward CMPA. Around 67.9% and 26.7% of respondents either strongly agreed or agreed that before dispensing medicine to a child, the pharmacist should ask the parent if this child has any allergies. 26.7% and 52.8% either strongly agreed or agreed that flavoring agents in a certain pharmaceutical brand can cause CMPA in a child who has multiple food allergies. However, only 3.1%, and 12.6% either strongly disagreed or disagreed that partially hydrolyzed formula (HA) is the best option for lactose intolerance and CMPA. Approximately

Table 3 Knowledge of Respondents Toward Treatment of Cow Milk Protein Allergy

Variable	Frequency	(%)
The first step in the treatment of cow milk protein allergy is:		
Allergen* elimination from a child's or a nursing mother's food	126	39.6%
Giving the child (or the nursing mother) normal food (not special for allergy) and antihistamines to the child to manage allergy symptoms.	36	11.6%
Giving the child (or the nursing mother) normal food (not special for allergy) and giving the child protein-free milk formula.	122	38.4%
I do not know.	34	10.7%
For a child with cow's milk protein allergy, the type of milk formula that can be used is:		
*Extensively hydrolyzed casein formula (EHCF) or Amino Acid formula (AAF)	79	24.8%
Partially hydrolyzed formula (HA)	36	11.3%
Lactose-free formula (LF)	126	39.6%
I do not know.	77	24.2%
Vitamins are essential for children with CMPA. Which one of the following is true about pharmaceutical formulations of vitamins?		
All brands contain proteins that can cause allergies.	33	10.4%
All brands are free of protein allergens.	80	25.2%
*Some brands contain proteins that can cause allergies, while others do not.	95	29.9%
I do not know if some brands contain proteins that may cause allergies or not.	110	34.6%
For the treatment of a child with CMPA, a strict diet with additional prohibited products for a period of time is required. The prohibited products include:		
*Certain types of shampoos, Soaps, and body creams.	69	21.7%
Some types of textiles.	22	6.9%
Some types of perfume	11	3.5%
Topical formulations are safe for children with CMPA.	216	67.9%

Notes: *Any substance that may cause allergic reaction in subjects with cow milk protein allergy.

Table 4 Attitude of Respondents Toward Cow Milk Protein Allergy

Attitude	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Before dispensing medicine to a child, the pharmacist should ask the parent if this child has any allergies.	216 (67.9%) *	85 (26.7%) *	11 (3.5%)	5 (1.6%)	1 (0.3%)
Flavoring agent in a certain pharmaceutical brand can cause an allergy in a child who has multiple food allergies	84 (26.7%)*	168 (52.8%) *	38 (11.9%)	25 (7.9%)	3 (0.9%)
Partially hydrolyzed formula (HA) is the best option for lactose intolerance and CMPA.	20 (6.3%)	120 (37.7%)	128 (40.3%)	40 (12.6%)*	10 (3.1%)*
Your recommendation to a mother of a child allergic to cow's milk protein is to avoid giving him any milk, milk products, or products that could be contaminated with milk.	106 (33.3%) *	133 (41.8%) *	27 (8.5%)	41 (12.9%)	11 (3.5%)
To avoid meat allergy as much as possible, a recently diagnosed child with CMPA should avoid meat for at least six months.	39 (12.3%)	140 (44%)	107 (33.6%)	26 (8.2%) *	6 (1.9%) *
For mild to moderate CMPA, an extensively hydrolyzed formula (EHF) is the best choice.	32 (10.1%) *	125 (39.3%) *	116 (36.5%)	39 (12.3%)	6 (1.9%)
Amino Acid Formula (AAF) is the safest milk formula for CMPA-positive.	26 (8.2%) *	121 (38.1%) *	121 (38.1%)	42 (13.2%)	8 (2.5%)
For a new baby whose older brother has CMPA, partially hydrolyzed formula (HA) is the best option. This is your recommendation for mothers.	24 (7.5%) *	145 (45.6%) *	92 (28.9%)	54 (17%)	3 (0.9%)
Capsules are preferable to tablets for a breastfeeding mother of a child with CMPA and a meat allergy.	26 (8.2%)	88 (27.7%)	113 (35.5%)	67 (21.1%)*	24 (7.5%) *

Notes: *The positive attitude.

1.9% and 8.2% of participants expressed significant disagreement or disagreement with the idea that a newly diagnosed child with CMPA should avoid meat for at least six months. In addition, 7.5%, and 21.1% of pharmacists expressed significant disagreement or disagreement with the idea that capsules are preferable to tablets for a breastfeeding mother of a child with CMPA and a meat allergy.

Association Between Socio-Demographic Characteristics of Respondents and Knowledge of Complications and Treatment of CMPA

As summarized in Table 5, data analysis revealed that there is no association between pharmacists' knowledge level toward complications of CMPA and their years of experience and educational level. Also, there is no association between

Table 5 Association Between Socio-Demographic Characteristics of Respondents and Knowledge of Complications and Knowledge of Treatment Toward Cow Milk Protein Allergy

Experience	Knowledge of Complications Toward CMPA*			P-value	Knowledge of Treatment for CMPA			P-value
	Low	Average	High		Low	Average	High	
Less than 1 year	22 (46.8%)	11 (23.4)	14 (29.8%)	0.486	30 (63.8)	12 (25.5%)	5 (10.6%)	0.911
1–5 years	68 (44.7%)	40 (26.3%)	44 (26.9%)		98 (64.5%)	38 (25%)	16 (10.5%)	
6–10 years	23 (29.9%)	27 (35.1%)	27 (35.1%)		53 (68.8%)	16 (20.8%)	8 (10.4%)	
11–15 years	9 (40.9%)	8 (36.4%)	5 (22.7%)		13 (59.1%)	8 (36.4%)	1 (4.5%)	
More than 15 years	7 (35%)	5 (25%)	8 (40%)		13 (65%)	4 (20%)	3 (15%)	
Post-graduation study								
Yes	52 (43.7%)	28 (23.5%)	39 (32.8%)	0.299	78 (65.5%)	24 (20.2%)	17 (14.3%)	0.118
No	77 (38.7%)	63 (31.7%)	59 (29.6%)		129 (64.8%)	54 (27.1%)	16 (8%)	

Notes: *CMPA: cow milk protein allergy.

Table 6 Association Between Socio-Demographic Characteristics of Respondents and Attitude Toward Cow Milk Protein Allergy

Years of Experience	Attitude		P-value
	Negative	Positive	
Less than 1 year	33 (70.2%)	14 (29.8%)	0.540
1–5 year	86 (56.6%)	66 (43.4%)	
6–10 year	46 (59.7%)	31 (40.3%)	
11–15 year	14 (63.6%)	8 (36.4%)	
More than 15 years	13 (65%)	7(35%)	
Post-graduation study			
Yes	72 (60.5%)	47 (39.5%)	0.971
No	120 (60.3%)	79 (39.7)	

Table 7 Association Between Knowledge of Treatment and Knowledge of Complication with Attitude Toward Cow Milk Protein Allergy

Knowledge of the Treatment of CMPA*	Attitude		P- value	Knowledge of Complications of CMPA	Attitude		P- value
	Negative	Positive			Negative	Positive	
Low	125 (60.4%)	82 (39.6%)	0.927	Low	71 (55%)	58 (45%)	0.219
Average	48 (61.5%)	30 (38.5%)		Average	56 (61.5%)	35 (38.5%)	
High	19 (57.6%)	14 (42.4%)		High	65 (66.3%)	33 (33.7%)	

Notes: *CMPA: cow milk protein allergy.

pharmacists' knowledge level toward the treatment of CMPA and their years of experience and post-graduation studies (p-values> 0.05).

Association Between Socio-Demographic Characters of Respondents and Attitude Toward CMPA

As shown in Table 6, there is no significant association between the attitude of respondents and their years of experience and their post-graduation studies (p-values> 0.05).

Association Between Knowledge of Complications, Treatment, and Attitude Toward CMPA

As shown in Table 7, data analysis revealed that there was no statistically significant association between knowledge of treatment toward CMPA and attitude of respondents (p-value:0.927), and also, no statistically significant association between knowledge of complications toward CMPA and attitude of respondents (P-value: 0.219)

Discussion

Community pharmacists have vital roles in patient counseling and recommending the appropriate action[12]. Patients have a direct connection with community pharmacists, particularly in developing countries where access to healthcare services

is limited.[14] Caregivers and mothers of children with CMPA need community pharmacists for guidance on selecting the proper type of milk formula, and brands free from specific allergens, including appropriate drugs, food supplements, and topical formulations for children allergic to CMP.[13] To our knowledge, this was the first study in Sudan that evaluated community pharmacists' knowledge and attitude toward CMPA.

The findings of the current study demonstrated the low level of knowledge of complications and treatment regarding CMPA among community pharmacists in Khartoum State. Just one-third of the participants (30.6%) had good knowledge of complications, and only 10.4% of them had good knowledge of the treatment of CMPA. Almost 74.2% and 59.7% of the respondent community pharmacists were familiar that CMPA can be life life-threatening condition, and it CMPA is associated with multiple protein allergies. (eg Gluten, soy, meat, and egg allergies), only 35.8% and about 20–27% of them were aware that CMPA can be linked to different food allergies and that its symptoms do not include tremors, headaches, or vision abnormalities, respectively. Although most participants (92.8%) know that symptoms could worsen if diet control is not practiced. However, their knowledge about the management of CMPA was relatively poor, less than half (39.6%) of the participants were familiar that allergen elimination from a child's or a nursing mother's food is the first step in the treatment of CMPA Moreover, approximately, 29.9% and 21.7% of respondents know that some pharmaceutical brands formulations containing proteins can cause allergies, and certain types of shampoos, Soaps, and body creams should be prohibited during treatment. Results of this study are similar to findings of a previous study that demonstrated the poor degree of CMPA knowledge among pediatricians, including general pediatricians, gastroenterologists, immunologists, and pulmonologists in Egypt.[15] Also, our results are similar to the finding of a study conducted in Kuwait among pediatricians.[16]

According to the findings of this study, the majority of community pharmacists in Khartoum State had experienced years ranging from one to five years and had no post-graduation study. No statistically significant association between respondents' characteristics and their knowledge of complications and treatment of CMPA. Along with the lack of a significant correlation between community pharmacist characteristics and their knowledge of CMPA. The poor knowledge of respondents, regarding CMPA complications and treatment, may point to deficiencies in curricula and training programs.[17] A recent comparative study in Turkey reported that Training significantly raised the degree of CMPA knowledge among pediatric residents and practicing pediatricians.[18]

The International Pharmaceutical Federation (FIP) states that providing patients with the necessary knowledge for the best possible use of pharmaceuticals is the responsibility of pharmacists and that patient counseling is a top priority.[19] Community Pharmacists need to have a solid understanding of CMPA to provide effective counseling. Among the strategies to enhance community pharmacists' knowledge of CMPA are graduate and undergraduate curriculum reform, and implementation of effective continuing professional development programs including formal training courses, symposiums, and workshops. Fortunately, according to a recent survey, the majority of community pharmacists in the Khartoum area were enthusiastic about continuing pharmacy education programs and had favorable opinions on patient counseling.[12]

Regarding the attitude of respondents' community pharmacists toward CMPA, 60.38% of participants had a negative attitude about CMPA, whereas 39.62% of participants had a positive attitude. Compared to other studies conducted in Spain, the overall attitude score of community pharmacists in the current study is markedly lower than the score of pediatricians 62%, and family physicians 54%.[20] Since information regarding pharmacists' knowledge and attitudes toward CMPA is lacking, the findings of this study were compared to those of previous studies conducted among other health professions.

A high percentage of respondents 67.9%, and 26.7% either strongly agree or agree that the pharmacist should inquire with the parent about the child's allergies before dispensing medication, and 26.7%, 52.8% of them either strongly agree or agree that flavoring agent in certain pharmaceutical brand can cause allergy in a child who has multiple food allergies. However, less than 15% of respondents strongly disagree or disagree that partially hydrolyzed formula (HA) is the best option for lactose intolerance and CMPA. Also, they strongly disagree or disagree that a mother should not offer her allergic child milk or any products containing milk. Similarly, less than 10% of the respondents either strongly disagree or disagree that a recently diagnosed child with CMPA should refrain from eating meat for at least six months. Moreover,

less than 30% of respondents either disagree or disagree that capsules are preferable to tablets for a breastfeeding mother of a child with CMPA and a meat allergy.

The World Health Organization (WHO) advocated for more involvement in the health care system and the use of pharmacists' extensive academic credentials. Therefore, FIP suggests that the growth of the pharmacist's function be replicated in student learning and pharmacists' ongoing education.[21] Along with the limited health care centers for breastfeeding mothers and children in Sudan.[11] Community pharmacists need to consider CMPA as a potential diagnosis for infants with unresolved symptoms and non-responsiveness to medicinal interventions. Community Pharmacists should counsel parents to take their infants to their general practitioner if CMPA is detected. They should record the milk products they consume and the period when symptoms initially arise, even if they are exclusively breastfeeding, since this will aid in the diagnosis. Pharmacists should advise parents that there are substitute milk formulations available and that there are no long-term concerns if a baby is diagnosed with CMPA.

Limitations

One potential limitation of this study is its low generalizability because it was limited to the Khartoum state, meaning it does not fully represent the views of Sudan's pharmacy community as a whole. One other limitation is that it was cross-sectional research that was given to the participants all at once. However, participants' knowledge and practice may change with exposure to experiences and continuing professional development courses. Additionally, this study did not include the pharmacists' age and sex.

Conclusion

Community pharmacists in Khartoum State have inadequate levels of knowledge and attitude toward complications and treatment of CMPA. About 40% of the participants had poor knowledge of CMPA complications, and 65% had poor knowledge of CMPA treatment. In addition, 60% of the participants had a negative attitude toward this disease. Thus, planning and implementation of effective continuing professional development programs are essential to improve community pharmacist's knowledge and attitude toward CMPA.

Disclosure

The authors report no conflicts of interest in this work.

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