Assessment of Knowledge and Attitude of Community Pharmacists towards OfLabel Medications in Khartoum State: A Descriptive CrossSectional Study

Abstract

Background: Healthcare providers, including pharmacists who prescribe medications, have a professional obligation to select treatments that are in the best interests of their patients. Consequently, the concept of off-label drug use, where drugs are used outside their approved indications, dosages, routes, or patient groups, often appears in medical literature, continuing education, and online resources. This term can be contentious, linked to both significant benefits and risks for patients. This study aimed to assess community pharmacists' knowledge and attitudes towards off-label medications.

Methods: A descriptive cross-sectional study was conducted using a self-administered, 24-item questionnaire distributed to 330 randomly selected community pharmacies in Khartoum State from December 2020 to February 2021.

Results: A 100% response rate was achieved. Most respondents were female (63.3%), aged 25-29 years (59.5%), and had 1-6 years of experience (36.6%). Over 75.1% were familiar with the concept of off-label prescribing, primarily through practical experience rather than formal education. Reasons mentioned for off-label prescriptions included indications (76.5%). More than half (62%) believed that prescribing off-label drugs is illegal, and only 16% felt they had adequate knowledge about off-label drug use. Despite concerns about safety (51%) and efficacy (54.7%), the majority of pharmacists relied on the British National Formulary (50%) or national guidelines (18.1%) rather than local formularies or package inserts for information. While 59.5% agreed they had a responsibility to inform prescribers about off-label use, 51.5% felt similarly

towards informing patients. Regarding specific medications, 88% of respondents considered the use of metformin for obesity to be off-label, compared to 26.9% for pregabalin for neuropathic pain, and 66.7% and 31.3% for prazosin and clomiphene, respectively.

Conclusion: Community pharmacists in Khartoum State appear to have limited awareness and concerns about the issues surrounding off-label prescribing. Most acquired relevant knowledge through work experience rather than formal training.

Keywords: Off-label drug use, Community pharmacists, Knowledge, Attitude.

1. Introduction

Off-label drug use (OLDU) refers to the use of drugs for indications, doses, routes of administration, or patient groups that are not approved by the Food and Drug Administration (FDA) (1-3). While the FDA approves drugs based on established efficacy and safety(4), off-label use may be necessitated by situations where evidence is lacking or specific conditions arise, such as life-threatening cases, epidemics, or failures of approved therapies (5-7). OLDU is prevalent worldwide (8-11), with 13-69% of medications used off-label in hospitals and 2-100% in primary care settings in Europe (12). The term "off-label" does not imply improper, illegal, or investigational use but rather aims to benefit specific patients, enhance clinical outcomes, increase therapeutic options, and save lives in critical situations (7, 13). However, it can also increase the risk of adverse effects, complications, therapy failure, and costs(9, 14).

Pharmacists play a crucial role in ensuring the safe use of medications, which requires good knowledge, awareness, and attitude toward OLDU(8, 9). Hospital and community pharmacists indicated that they are somewhat familiar with this concept, according to existing studies. However, they noted that this knowledge was largely gained through practical experience rather than through their graduate or postgraduate training(8, 10).

Although off-label use of medications is a significant issue, no previous studies have addressed this topic in Sudan. Given the importance of the concept, this study was conducted to assess community pharmacists' knowledge and attitudes toward dispensing off-label medicines.

2. Methodology

2.1. Study setting

This descriptive cross-sectional survey targeted registered community pharmacists in Khartoum State, Sudan, conducted from December 2021 to March 2022.

2.2. Study population and sampling procedure

Registered community pharmacists working in Khartoum State pharmacies who agreed to participate were included. Those who declined were excluded.From 2,387 registered community pharmacists in Khartoum State (as per the Khartoum State Ministry of Health - Directorate of Pharmacy)(15, 16), a sample of 332 pharmacists was calculated using Raosoft sample size calculation software, with a 95% confidence interval and a 5% margin of error. These pharmacists were selected using a simple random method.

2.4. Data Collection Method

Data were collected using a validated self-administered questionnaire. The instrument was designed based on literature (2, 11), reviewed by experts, and pretested with 15 community pharmacists (excluded from the final results). The questionnaire's reliability was confirmed with a Cronbach alpha of 0.72.The questionnaire comprised 28 questions divided into three sections: demographics and professional characteristics, knowledge (17 questions including tick-box and scale responses), and attitude (7 Likert scale questions).

2.5. Data Management and Analysis

In the knowledge section, each correct answer was assigned a score of one, while incorrect answers received a score of zero. The total score ranged from 0 to 8: scores of 1-3 indicated poor knowledge, 4-6 represented average knowledge, and 7-8 signified good knowledge. For the attitude section, questions were rated on a 4-point Likert scale for 5 items and a different 4-point Likert scale for 3 items, yielding a total score from 0 to 14. Higher scores reflected more positive attitudes. Attitudes were categorized as negative (scores of 0-3), fair (scores of 7-9), or positive (scores of 10-14)(17).

Data were analyzed using SPSS version 24.0 (IBM SPSS Inc., Chicago, IL).Descriptive analysis was carried out using frequencies and percentages. The association between different variables was also determined using the Chi-square and cross-tabulation statistics. A p-value of <0.05 was considered statistically significant.

3. Results

3.1. Socio-Demographic Characteristics

Out of 332 distributed questionnaires, 330 community pharmacists responded, yielding a response rate of 99.4%. Among the respondents, 209 (63.3%) were female and 121 (36.7%) were male. Most participants, 196 (59.4%), were aged between 25 and 29 years. A majority, 233 (70.6%), held a B. Pharm degree, and most had professional experience ranging from 1 to 3 years or 3 to 6 years (36.6%) (Table 1).

Table 1: Socio-demographic and professional characteristics of the study sample (n=330)

Socio-demographic characteristics		**Percentage**
Gender	Male	36.7%
	Female	63.3%
Age	20-24	15.4%
	25-29	59.4%
	30-34	19.5%
	35-40	4.3%
	>40	1.4%
Qualification	Bachelor degree	70.6%
	Mater degree	28.2%
	PHD	1.2%
Year of experience	< 1	8.5%
	1-3 years	36.6%
	3-6 years	36.6%
	6 years and above	18.3%

3.2. Knowledge about Off-Label Drugs

Most respondents, 248 (75.1%), were familiar with the concept of off-label drug use. Of these, 161 (48.8%) had gained their knowledge through practical experience. However, 174 (52.8%) were unsure whether off-label drug use is legal or if drug companies can promote such

use. When asked about specific examples of off-label prescribing, the majority, 291 (88.1%), identified the use of Metformin for obesity as an example of off-label use (Table 2).

Table 2. Knowledge of the studied community pharmacists regarding Off-label drug use (OLDU) (n=330)

Questions	Correct answers N (%)	Wrong answers N (%)
1. What is the definition of the concept OLDU?	248 (75.1%)	82 (24.9)
2. If you know its meaning, how did you know the concept?	Dispensing experience	161 (48.8)
	Undergraduate courses/lectures.	136 (41.3)
	Postgraduate course/lecturers.	33 (9.9)
3. Does the off-label drug use is legal?	156 (47.2%)	174(52.8)
4. Can drug companies promote off-label drug use?	92(27.8%)	238 (72.2)
5. Which of the following is an examples for OLDU?		
Metformin	291 (88.1%)	39 (11.9)
Propranolol	277 (84%)	53 (16)
Prazosin	220 (66.7%)	110 (33.3)
Clomide (clomifene citrate)	103 (31.1%)	227 (68.9)
Pregabline	89 (26.9%)	241 (73.1)

Of the respondents, 37.7% indicated that they dispensed off-label drugs "rarely." Among those who did dispense off-label medications, 76.5% did so for off-label indications. However, the use of these drugs was associated with concerns about adverse reactions (41.1%) and increased therapeutic errors (24.6%). Additionally, 53% of participants reported that information on the risks and benefits of off-label drug use was inadequate, and 48% of pharmacists felt they lacked sufficient knowledge about this practice. Regarding sources for evaluating prescriptions, 50% of participants relied primarily on the British National Formulary (BNF) (Table 3).

Table 2.Response percentages for various knowledge questions among the studied community pharmacists regarding Off-label drug use (OLDU) (n=330)

Question	Answers	Percent %
1. How often do you dispense off-label drugs?	Sometimes	24.7%
	Often	14.2%
	Rarely	37.7%
	Never	23.4%
2. In The majority of cases; what is the off-	Indication	76.5%

label prescription you dispensed for?	Dosage	11.1%
	Route of administration	12.4%
3. Variable/s contributing to off-label prescription (can choose more the one option)	Initiation of new drug therapy	32.2%
	Non-specific goal of medical prescribing	32.6%
	The rural location of practice	35.2%
4. What is the risk/s related to off-label use of medicines in your experience? (can choose more than one option)	Adverse reaction	41.1%
	Inefficiency	20.5%
	Improper formulation	13.8%
	increase therapeutic errors	24.6%
5. To what extent does the use of the off-label drugs impact negatively on prescriptive appropriateness?	Much	26.1%
	not much	34.2%
	Little	28.6%
	Not at all	11.2%
6. Do you think the risk/benefit information available on the off-label use of drugs is appropriate?	Yes	46.6%
	No	53.4%
7. Do you consider your knowledge of the use of the off-label medication is adequate?	Yes	16.0%
	No	48.8%
	not sure	35.2%
8. What is the source/s of information you relay on and evaluate the prescription? (can choose more than one option)	BNF	50%
	The package insert	14.4%
	Local formularies	11.4%
	National guideline	18.1%
	Medscape	1.9%
	Website	2.7%
	Other	1.5%

After calculating the overall knowledge scores, the majority of respondents had an average level of knowledge (78.2%) (Figure 1). Significant associations were found between the level of knowledge and both gender (p-value = 0.001) and age (p-value = 0.007). In contrast, there were no significant associations with years of practice (p-value = 0.760) or qualification (p-value = 0.404), according to the chi-square test (Table 4).

Table 3. Cross tabulation between knowledge of community pharmacists toward Off-label drug use (OLDU) with other independent variables.

Variables		**Level of knowledge**			**p-value**
		Good	**Average**	**Poor**	
Gender	Male	1.9%	19.8%	14.8%	0.001
	Female	5.9%%	47.2%	10.5%	

Age	20-24	1.2%	9.3%	5.0%	0.007
	25-29	2.5%	43.0%	14.2%	
	30-34	3.7%	11.8%	3.7%	
	35-40	0.0%	2.5%	1.9%	
	>40	0.0%	0.6%	0.6%	
Qualifications	Bachelor degree	4.9%	45.1%	19.8%	0.404
	Master degree	2.8%	20.1%	5.6%	
	PhD	0.0%	1.2%	0.0%	
Years of practice	< 1	0.6%	6.2%	1.9%	0.760
	1-3 years	2.8%	22.5%	11.1%	
	3-6 years	2.5%	25.9%	8.0%	
	>6 years	1.9%	12.3%	4.3%	

3.3. Attitude towards Off-Label Drugs

Regarding pharmacists' attitudes, 57.9% of participants demonstrated a good attitude toward off-label drug use, while 22.4% showed a poor attitude and 19.6% had an average attitude (Figure 1). Of the respondents, 86.6% were agreed with the statement of "off-label prescribing is not illegal and sometimes be clinically appropriate but is associated with a number of clinical safety and ethical issues". The responses for other attitude questions are represented in Table 5.

Table 4. Response percentages for attitudequestions among the studied community pharmacists regarding Off-label drug use (OLDU) (n=330)

Question	**Response %**			
	Agree	**Strongly agree**	**Disagree**	**Strongly disagree**
1. The off-label prescribing is not illegal and sometimes be clinically appropriate but is associated with a number of clinical safety and ethical issues.	70.6%	16.0%	12.9%	6%
2. The ethics surrounding off-label use become more complicated when considering medications with less clear-cut positive or negative risk/benefit ratios.	65.6%	22.1%	11.7%	6.0%
3. Role of pharmacist in the process of the off-label prescribing; The pharmacist has a responsibility to inform the prescriber that they are prescribing off-label	59.5%	22.7%	16.0%	1.8%
4. The pharmacist has a responsibility to inform the patient that the medicines for there are off-label	51.5%	15.3%	23.9%	9.2%

5. The expanding role of community pharmacist is ensuring public health and safe medicines use and understanding of issues surrounding off-label prescribing is essential.	52.2%	39.1%	5.0%	3.75
6. Do you concern with the effectiveness of the off-label medicines dispensed?	**Yes**	**No**	**Neutral**	
	54.7%	13.0%	32.3%	
7. Do you concern with the safety of the off-label medicines dispensed?	51.6	17.4%	31.1%	

Most respondents had acceptable attitudes, with significant associations found between attitude levels and years of practice (p-value = 0.001). In contrast, there were no significant associations with gender (p-value = 0.481), age (p-value = 0.527), or qualification (p-value = 0.250), according to the chi-square test (Table 6).

Table 5. Cross tabulation between the community pharmacists' attitude toward Off-label drug use (OLDU) with other independent variables.

Variable		**Level of attitude**			**P-value**
		good	Average	poor	
Gender	Male	3.7%	28.2%	4.9%	0.481
	Female	7.4%	50.0%	5.8%	
Age	20-24	2.5%	11.7%	1.2%	0.527
	25-29	7.4%	44.9%	7.1%	
	30-34	1.2%	16.6%	1.8%	
	35-40	0.0%	3.7%	0.6%	
	>40	0.0%	1.2%	0.0%	
Qualification	Bachelor degree	8.0%%	54.9%	7.7%	0.250
	Master degree	3.1%%	22.1%	2.5%	
	PHD	0.0%	0.6%	0.6%	
Year of practice	< 1	1.8%	6.1%	0.6%	0.001
	1-3 years	5.5%	27.6%	3.1%	
	3-6 years	3.7%	28.5%	4.6%	
	6 years and above	0.0%	16.0%	2.5%	

4. Discussion

Given the crucial role of community pharmacists in ensuring the rational and safe use of medicines, understanding off-label prescribing issues is essential. This first study assessed community pharmacists' knowledge and attitudes toward off-label drug use in Sudan. The

findings are vital for designing effective educational strategies and training programs, as well as informing policy development.In this study, 330 randomly selected community pharmacists from Khartoum State completed the questionnaire. The majority of respondents were female (63.3%), which reflects the trend observed in many countries where pharmacy is a popular career choice among women (18-21). Most participants had 3-6 years of experience and were aged 25-29, a demographic trend likely due to young pharmacists starting their careers in community settings and the challenges associated with career advancement and financial issues in this sector (22, 23).

Although 75.1% of participants were familiar with off-label prescribing, the majority acquired this knowledge through practical experience (48.8%) rather than formal undergraduate (41.4%) or postgraduate (9.9%) training. This highlights a significant gap between educational curricula and the competencies needed for effective practice, similar to findings reported by Stewart et al. (10). In contrast, a 2011 study in Ireland found that most pharmacists gained their knowledge primarily through undergraduate studies rather than experience or postgraduate education (24).

Despite the illegality of promoting off-label medicines, 72% of participants believed that companies could engage in such promotion, potentially due to a lack of accurate information and misleading promotions by some companies. Off-label uses can offer valuable therapeutic options. For example, Metformin is used off-label for conditions such as polycystic ovary syndrome and obesity (25,26). Propranolol is sometimes used off-label to manage anxiety disorders, especially performance anxiety (27). Clomiphene is occasionally used off-label to treat male infertility, as it may increase testosterone levels and improve sperm parameters (28). Pregabalin is also used off-label for conditions like neuropathic pain (29). In the current

study,knowledge about specific off-label uses varied: 88.1% of participants recognized the use of Metformin for obesity and 84% knew about Propranolol for anxiety. However, most were unfamiliar with Clomiphene Citrate for male infertility (68.9%) and Pregabalin for neuropathic pain (73.1%). This discrepancy may be attributed to the more common use of Metformin, Pregabalin, and Propranolol and the higher prevalence of conditions they address (25-30).

Regarding dispensing practices, 38% of respondents rarely dispensed off-label drugs, while 24.7% did so sometimes, and 23.4% never. The majority of those who did dispense off-label drugs did so based on indications (76.5%). The hesitancy to dispense may be related to a lack of information on risk/benefit ratios (53.4%). This contrasts with an Italian study where 40% of participants used off-label medications “sometimes” (31).

Forty-one percent of pharmacists believed off-label drug use might increase the risk of adverse drug reactions and therapeutic errors, primarily due to insufficient risk/benefit information (53.4%) and inadequate evidence. This is consistent with studies indicating increased risks of adverse reactions and medication errors associated with off-label use (32). The primary sources of information for community pharmacists were the British National Formulary (50%), national guidelines (18%), drug package inserts (14.4%), and local formularies (11.4%). Websites and databases were used less frequently (2.7% and 1.9%, respectively), possibly due to access issues and the time required to search these sources, aligning with findings from the UK (10).

Overall, respondents demonstrated average knowledge levels, significantly associated with gender (p-value = 0.000) and age (p-value = 0.007), but not with years of practice (p-value = 0.760) or qualification (p-value = 0.404). This reflects the relatively young age of many pharmacists and their reliance on practical experience rather than formal education(11, 24, 32).

Regarding attitudes, 58% of pharmacists had a good attitude toward off-label drug use, compared to 22.4% with poor attitudes and 19.6% with average attitudes. Most (87%) believed off-label use is legal but associated with clinical safety and ethical issues, while 88% felt the risk of complications increases with less supporting evidence. These views are consistent with numerous studies (33-35). The majority agreed that pharmacists should inform healthcare providers (59.5%) and patients (51.5%) about off-label use, highlighting their role in ensuring drug safety and effectiveness.

The study's limitations include its cross-sectional design and focus on community pharmacies in Khartoum, which may not be generalizable to all of Sudan. Further research is needed to encompass a broader range of community pharmacists across the country, and exploring the factors contributing to the uncertainties surrounding the legality and safety of off-label prescribing would provide a deeper understanding of the challenges pharmacists face. Despite these limitations, this study is the first of its kind in Sudan to evaluate community pharmacists' knowledge and attitudes toward off-label drug use.

Conclusion

Community pharmacists in Khartoum State exhibit variable knowledge and attitudes towards off-label drug use. Experience and practice positively influence their knowledge and attitudes. Further research across a wider geographical area is needed to generalize findings.

Consent

Written informed consent was obtained from all participants, and confidentiality was maintained.

Ethical Approval

The study adhered to the 1975 Declaration of Helsinki and was approved by the Ethical Committee of the Faculty of Pharmacy, University of Khartoum (FPEC-29-2022).

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

References

1. Balan S, Hassali MA, Mak VS. Awareness, knowledge and views of off-label prescribing in children: a systematic review. Br J Clin Pharmacol. 2015;80(6):1269-80.

2. Stafford RS. Regulating off-label drug use--rethinking the role of the FDA. N Engl J Med. 2008;358(14):1427-9.

3. Meng M, Liu E, Zhang B, Lu Q, Zhang X, Ge B, et al. Guideline for the management of pediatric off-label use of drugs in China (2021). BMC Pediatr. 2022;22(1):022-03457.

4. Rodwin MA. Rooting out institutional corruption to manage inappropriate off-label drug use. J Law Med Ethics. 2013;41(3):654-64.

5. Wittich CM, Burkle CM, Lanier WL. Ten common questions (and their answers) about off-label drug use. Mayo Clin Proc. 2012;87(10):982-90.

6. Salari P, Larijani B, Zahedi F, Noroozi M. Off-label prescription: developing a guideline and validating an instrument to measure physicians' and clinical pharmacists' knowledge and attitudes toward off-label medication use. J Diabetes Metab Disord. 2023;22(2):1599-608.

7. Schrier L, Hadjipanayis A, Stiris T, Ross-Russell RI, Valiulis A, Turner MA, et al. Off-label use of medicines in neonates, infants, children, and adolescents: a joint policy statement by

the European Academy of Paediatrics and the European society for Developmental Perinatal and Pediatric Pharmacology. Eur J Pediatr. 2020;179(5):839-47.

8. Mukattash TL, Alzoubi KH, Abuirjie AM, Jarab AS, Abu Farha RK, Nusair MB, et al. Perceptions and attitudes towards off-label dispensing for pediatric patients, a study of hospital based pharmacists in Jordan. Saudi Pharm J. 2018;26(1):20-4.

9. Basak R, McCaffrey DJ, 3rd. Hospital pharmacists' perceived beliefs and responsibilities in indication-based off-label prescribing. Int J Clin Pharm. 2018;40(1):36-40.

10. Stewart D, Rouf A, Snaith A, Elliott K, Helms PJ, McLay JS. Attitudes and experiences of community pharmacists towards paediatric off-label prescribing: a prospective survey. Br J Clin Pharmacol. 2007;64(1):90-5.

11. Balan S, Ahmad Hassali MA, Mak VSL. Attitudes, knowledge and views on off-label prescribing in children among healthcare professionals in Malaysia. Int J Clin Pharm. 2019;41(4):1074-84.

12. Saiyed MM, Ong PS, Chew L. Off-label drug use in oncology: a systematic review of literature. J Clin Pharm Ther. 2017;42(3):251-8.

13. Frattarelli DA, Galinkin JL, Green TP, Johnson TD, Neville KA, Paul IM, et al. Off-label use of drugs in children. Pediatrics. 2014;133(3):563-7.

14. Cras A, Conscience MA, Rajzbaum G, Lillo-Le Louët A, Lopez N, Tersen I, et al. Off-label prescribing in a French hospital. Pharm World Sci. 2007;29(2):97-100.

15. Badi S, Hamed A, Abualama M, Mustafa M, Abdulraheem M, Yousef B. Knowledge, attitude, and practice of sudanese pharmacists toward COVID-19 in Khartoum State, Sudan: An online-based cross-sectional study. Libyan International Medical University Journal. 2021;06(01):19-26.

16. Babiker LA, Babiker AO, Badawi BAK, Abdalla RA, Abdalla RM, Hassan ZF, et al. Knowledge and practice about mycetoma infection among community pharmacists in Khartoum State: A descriptive cross-sectional study. Informatics in Medicine Unlocked. 2023;37:101175.

17. Gafar MA, Yousef BA, Ibrahim A, Osman ZA. Knowledge, Attitude, and Practice of Community Pharmacists Toward Tablet Splitting and Crushing at Omdurman Locality: A Cross-Sectional Study. Current Medical Issues. 2021;19(2):94-102.

18. Alnahar SA, Mamiya KT, John C, Bader L, Bates I. Experience with pharmacy academic programmes and career aspirations of pharmacy students and young pharmacists-an international cross-sectional study. BMC Med Educ. 2022;22(1):022-03510.

19. Ibrahim M, Badi S, Yousef B. Knowledge and practice of community pharmacists toward dispensing of cough medications for children Khartoum State: A cross-sectional study. Intern J Health Allied Sci. 2020;9:147-52.

20. Loo JSE, Lim SW, Ng YK, Tiong JJL. Pharmacy students in private institutions of higher education: motivating factors when studying pharmacy and influences on university choice. Int J Pharm Pract. 2017;25(6):429-37.

21. Arbab AH, Eltahir YAM, Elsadig FS, Yousef BA. Career Preference and Factors Influencing Career Choice among Undergraduate Pharmacy Students at University of Khartoum, Sudan. Pharmacy. 2022;10(1).

22. Lynch M, O'Leary AC. Understanding the factors influencing community pharmacist retention - A qualitative study. Explor Res Clin Soc Pharm. 2023;12(100329).

23. Seston E, Hassell K, Ferguson J, Hann M. Exploring the relationship between pharmacists' job satisfaction, intention to quit the profession, and actual quitting. Res Social Adm Pharm. 2009;5(2):121-32.

24. Mukattash T, Hawwa AF, Trew K, McElnay JC. Healthcare professional experiences and attitudes on unlicensed/off-label paediatric prescribing and paediatric clinical trials. Eur J Clin Pharmacol. 2011;67(5):449-61.

25. Le S, Lee GC. Emerging Trends in Metformin Prescribing in the United States from 2000 to 2015. Clin Drug Investig. 2019;39(8):757-63.

26. Drzewoski J, Hanefeld M. The Current and Potential Therapeutic Use of Metformin-The Good Old Drug. Pharmaceuticals. 2021;14(2).

27. Aljahdali S, Badr R, Alotaibi M, Alhelali S, Abdullatif G, Alshanberi A, et al. Propranolol Use Among Healthcare Students in Saudi Arabia. Cureus. 2023;15(11).

28. Jiang T, Sigalos JT, Osadchiy V, Santamaria A, Zheng MH, Modiri N, Regets KV, Mills JN, Eleswarapu SV. Temporal Changes of Clomiphene on Testosterone Levels and Semen Parameters in Subfertile Men. World J Mens Health. 2023;41(1):198-203.

29. Schjerning O, Rosenzweig M, Pottegård A, Damkier P, Nielsen J. Abuse Potential of Pregabalin: A Systematic Review. CNS Drugs. 2016;30(1):9-25.

30. Naseri A, Sanaie S, Hamzehzadeh S, Seyedi-Sahebari S, Hosseini MS, Gholipour-Khalili E, et al. Metformin: new applications for an old drug. J Basic Clin Physiol Pharmacol. 2022;34(2):151-60.

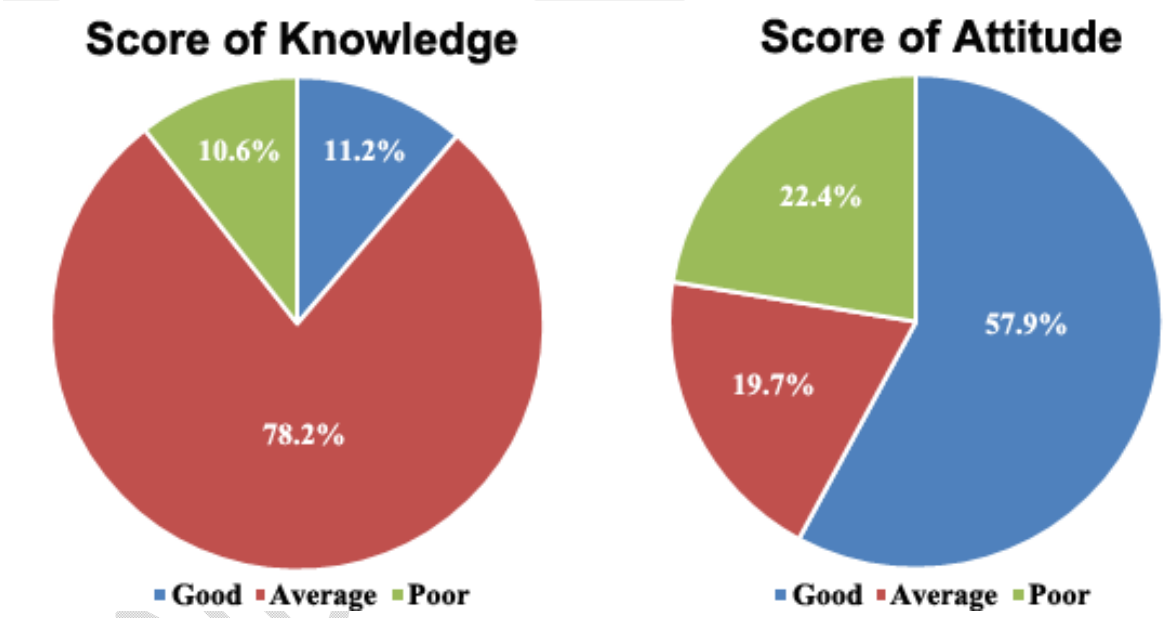
31. Saullo F, Saullo E, Caloiero M, Menniti M, Carbone C, Chimirri S, et al. A questionnaire-based study in Calabria on the knowledge of off-label drugs in pediatrics. J Pharmacol Pharmacother. 2013;4(Suppl 1):120960.

32. Shakeel S, Iffat W, Qamar A, Nesar S, Butt F, Siddiqui SN, et al. Assessment of Knowledge, Attitude, and Practice of Obstetricians and Gynecologists Toward Off-Label Medicine Use in Female Reproductive Health Issues. Front Public Health. 2022;10(829339).

33. Neubert A, Dormann H, Weiss J, Egger T, Criegee-Rieck M, Rascher W, et al. The impact of unlicensed and off-label drug use on adverse drug reactions in paediatric patients. Drug Saf. 2004;27(13):1059-67.

34. Han N, Oh JM, Kim IW. Adverse Events Related to Off-Label Drugs Using Spontaneous Adverse Event Reporting Systems. Ther Clin Risk Manag. 2021;17:877-87.

35. Sridharan K, Al Jufairi M, Al Ansari E. Off-label drug use and the risk of medication errors in critically ill neonates: A conceptual pilot study. Int J Risk Saf Med. 2021;32(4):279-93.



(a) (b)

Fig 1. Pie chart showing (a) score of knowledge and (b) score of attitude