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Knowledge and Attitude of Pharmacists Regarding Climate Change and its Impact on Drugs in Jalalabad City

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ABSTRACT
Climate change is a serious problem that affects several areas of the community, including the pharmaceutical sector. Drugs are risk factor for climate change, and drugs can have an impact on every component of life. Pharmacists are essential in guaranteeing the accessibility and effectiveness of drugs, and their understanding of and perspectives on climate change can greatly influence their capacity to tackle the issues raised by this worldwide occurrence. The aim of this study was to evaluate the knowledge and attitude of pharmacists regarding climate change and its effects on drugs in Jalalabad city. This questionnaire-based, cross-sectional study was carried out among 191 male pharmacists in Jalalabad City. A validated questionnaire was used to assess the participants' knowledge and attitudes of pharmacists regarding climate change and its impact on drugs. Participants in the study had to be adults over the age of twenty. The study period was October 2023 – December 2023. Of 200 pharmacists the ask questions response rate were 95.5% (nine form were incomplete) ،minimum age was 20 year and maximum was 55 years، mean age± SD was 34.66±8.64. 148 (77.5%) of participants had poor knowledge of climate change and 43 (22.5%) had good knowledge. There was no association between the education level and knowledge of participants regarding the climate change and it impact on drugs (p= 0.073). The study's findings indicate that Jalalabad city's pharmacists are not well educated on the possible impacts of climate change on pharmaceuticals. In light of changing environmental conditions, this lack of awareness may have detrimental effects on the accessibility and effectiveness of pharmaceuticals.
Keywords: Climate Change،Drug،Jalalabad,Pharmacy،Pharmacist

INTRODUCTION
An important health issue for the next several years is climate change. Deaths from heart attacks, strokes, lung cancer, and chronic respiratory illnesses are caused with climate change (WHO, 2020). According to reports, between 2030 and 2050, heat stress, diarrhea, malaria, and malnutrition will lead to 250000 deaths annually as a result of climate change (WHO, 2018). Every year, air pollution in Canada causes over 20,000 premature mortality (Eckelman et al., 2018). Children, elderly people, and patients with underlying health conditions are considered at greatest risk (WHO, 2018). The risk of developing chronic kidney disease of unknown cause (CKDU) has a clear association with extreme temperatures (Madero, 2020; Priyadarshani et al., 2023). The proper use of medications is notably the responsibility of pharmacists. One of the most important things a pharmacist can do to avoid contributing to climate change is to switch from metered dose inhalers (MDIs) to soft inhalers, Explain the patient how to use the inhaler appropriately to minimize waste (NHS, 2020; NIC, 2019). To get the medication into the lungs, certain inhaler types utilize gas. The gas has an impact on climate change (Roy, 2021). Reveal that inhaled anesthetics with lower carbon content—such as sevoflurane—than desflurane and increasing patient awareness regarding appropriate medication disposal (Roy, 2021; Singleton et al., 2018). Worldwide, pharmaceutical waste provides a risk to both people and the environment. Every stage of a pharmaceutical's life cycle (manufacturing, usage, and disposal) can result in environmental contamination. Drugs, even at modest dosages, can be harmful to people, plants, and vegetables. Drugs must contain biologically active ingredients that are resistant to metabolic breakdown in order for their active ingredients to remain safe and effective. It indicates that they need to continue keeping active outdoors. Growth inhibition, behavioral conditions and reproductive failure are examples of possible side effects of active pharmaceutical ingredients (APIs),(Roy, 2021). Pharmaceutical residual of Diclofenac causes renal failure (Eckelman & Sherman, 2016). pharmaceutical residues of antibiotics such as Ciprofloxacin can increase the

incidence of antimicrobial resistance (Mallon & Cox, 2022). Because of the connection between the provision of healthcare and climate change, one of the most important responses from the healthcare industry is climate change minimizing harm (Chen et al., 2023).

The aim of this study was to evaluate the knowledge and attitude of pharmacists regarding climate change and its effects on drugs in Jalalabad city. In order to develop targeted actions and policies that guarantee the pharmaceutical industry's resilience in order of environmental issues, it is essential to understand the knowledge and attitudes of pharmacists regarding climate change. The main objective of the study is to further knowledge of how pharmacists could assist in reducing the effects of climate change on drug availability and quality, which will eventually improve patient outcomes in Jalalabad City.

MATERIALS AND METHODS

Study Area

This questionnaire-based, cross-sectional study was carried out among 191 male pharmacists in Jalalabad City. Participants in the study had to be adults over the age of 20 years. Consequently, pharmacies were used to find the subjects. Study period: October 2023 – December 2023.

Samples Collection

Questionnaire was designed to collect the Samples. The study's questionnaire was self-developed and verified before being used. It has been divided into three parts with 14 questions. Two questions about the participants' demographic information made up the first section of the questionnaire. The participants' knowledge about drugs and climate change were discussed in the second part. Each pharmacist took a knowledge test consisting of eight yes/no questions concerning pharmaceuticals and climate change. The respondents' attitudes were evaluated in relation to four yes/no questions concerning drugs and climate change. Primarily, this questionnaire was created in Pashto and was revised, examined, and changed in light of interviews conducted with lay pharmacists regarding the range of pharmaceutical industry practices that are available in Afghanistan.

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS), Version 22 (IBM Corp), was used to analyze the data from the questionnaire after it was entered into Microsoft Excel. The data was presented as percentages or as mean ± standard deviation (SD). P-values were considered significant if they were less than 0.05.

Research Approval

Approval for the study was given by the research committee of Nangarhar University (03-Sep-2023), prior to its commencement. The participants were informed of the purpose and reasoning behind the study before they could begin answering the questionnaire, and they had to agree to answer the questionnaire.

RESULTS

Out of the 200 pharmacist sampled for the study, 191 (95.5%) completed the questionnaire. Nine questioners were incomplete and omitted form the study. Reponses are shown in the Table 1. Minimum age was 20 year and maximum was 55 years،mean age± SD was 34.66±8.64. 125 of pharmacists had diploma in pharmacy and 66 of them had just passed 12 class. In this study all participants were male.

We created perception-related questions to assess pharmacists' answers to inquiries concerning how climate change affects medications. Pharmacists were questioned about how they saw the threat of climate change's effects on medications and whether or not. The method other authors used to score their work was used to assess participants knowledge (Mpazi & Mnyika, 2005; Tavoosi et al., 2004). One point was awarded for each right response, while 0 points were awarded for wrong responses. (responding accurately to at least four of the eight questions). A total of 8 questions assessed knowledge; every correct answer was scored 1, and every wrong answer was given a score of 0. The overall knowledge score was computed, and the final total score was divided into two categories. A score of 0–4 was categorized as poor knowledge, and a score of ≥5 was categorized as good knowledge. 148 (77.5%) of participants had poor knowledge of climate change and 43(22.5%) had good knowledge. There was no association between the education and knowledge of participants about the climate change and it is impact on drugs.

Table 1. Shows the Knowledge and Attitudes of Pharmacists regarding Climate Change.

Questions	Responses			
	Yes		No	
	Frequency	Percent	Frequency	Percent
What is climate?	153	80.1	38	19.9
What is climate change?	102	53.4	89	46.4
How climate change?	67	35.1	124	64.9
What are the signs of climate change?	50	26.2	141	73.8
Do you think that climate change is a critical problem?	141	73.8	50	26.2
Can climate change affect medicine?	61	31.9	130	68.1
How can we prevent the destruction of medicine by climate change?	55	28.8	136	71.2
Can drug causes climate change?	87	45.5	104	54.5
Have the pharmacists any responsibility for climate change?	59	30.9	132	69.1
Being a pharmacist what response have you shown to climate change?	61	31.9	130	68.1
have you any preventive measure in your pharmacy against climate change bad effects on drug?	63	33.0	128	67.0
Should we look after climate change during stocking drugs?	127	66.5	64	33.5

DISCUSSION

This is the first study in Jalalabad city to assess pharmacists' knowledge and attitudes on climate change and how it affects pharmaceuticals. According to this study, 53.4% of pharmacists were aware of climate change, and 73.8% considered it to be an important problem. A cross sectional study has been done in Ethiopia about Knowledge and perceptions of health sciences students according to the impact of climate change shows that the majority (77.5%) of heath science students were aware of climate change. This high awareness level was similar to those reported for adults by two studies in Europe (88.0%) and the United States (82.0%) but higher than in a study in various countries in Africa, where an average of 44.0% of adults were aware of climate change (Nigatu et al., 2014).

This study shows that only 35.1% of the pharmacists know that how climate changes. On the other hand, in a cross-sectional survey of medical, public health، and nursing students in the universities of China about relationships between knowledge of the causes and supposed impacts of climate change shows an overwhelming belief in the respondents that climate change is generally “bad” and bad for human health. However, only 60% of the respondents could correctly identify the causes of climate change(Yang et al., 2018).

Our study show that 31.9% of pharmacists were aware that climate change can affect medicine Other research which has been done in Malawi according to the knowledge, attitude and practices survey for personnel who manage medicine stores in various health facilities show that Poor pharmaceutical storage has direct impact on the quality of the products (Yamashita et al., 2018). High temperatures accelerate degradation mechanisms for products such as hydrolysis and oxidation (Gabrič et al., 2022). Patients should be taught about sustainable health care. Leadership in the field should be encouraged to establish an environment that supports a sustainable health care system (Eckelman et al., 2018; Horrigan, 2005). By identifying gaps in knowledge and areas for improvement, this study can inform capacity-building initiatives for pharmacists to enhance their understanding of climate change-related issues and equip them with the necessary skills to adapt to changing environmental conditions.

In this research we found that 30.9% of the Pharmacists show that they have any responsibility to climate change which is different from a National Medical Association (NMA) survey of physicians that 78% of respondents “feel that actions they can take in their personal and professional lives can contribute to effective action on climate change (Maibach et al., 2014).

The difference in these findings suggest that there is a need to include education on pollution, climate change and health (Ard et al., 2016). This education should train health professionals to understand the complex ways in which climate change and pollution impact health(Yang et al., 2018).

CONCLUSION

The study's findings indicate that Jalalabad city's pharmacists are not well educated on the possible impacts of climate change on pharmaceuticals. In light of changing environmental conditions, this lack of awareness may have detrimental effects on the accessibility and effectiveness of pharmaceuticals. To ensure their patients' continued health and wellbeing, pharmacists must be educated about climate change and how it may affect medications. It necessitates further research and educational initiatives to resolve this knowledge and attitude gap among Jalalabad city's pharmacists.

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