EXPLORING PERCEPTION OF INDIVIDUALS ON USING ARTIFICIAL INTELLIGENCE FOR REPORTING SIDE EFFECTS OF MEDICINES.

Dissertation submitted to

The IIHMR University, Jaipur

for the partial fulfilment for the award of the

degree of Master of Business Administration

(MBA)

in

Hospital and Health Management

By

Dr. Ritu Raj
1371

Under the Supervision and Guidance of

Dr. Vinod Kumar SV

2023

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled **Exploring Perception of Individuals on Using Artificial Intelligence For Reporting Side Effects Of Medicines** is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished workof others has been duly acknowledged in the text.

Signature :

Name of the student: Dr. Ritu Raj

Date: 30th May 2023

CERTIFICATE

This is to certify that **Dr. Ritu Raj** in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur has successfully completed her internship at Scaler during February 20- May 19, 2023.

Place: Bangalore

Date: 30th May 2023

Preceptor/Head of the Organization: Anant Mittal

Name of the organization: Scaler

CERTIFICATE

This is to certify that dissertation titled **Exploring Perception of Individuals on Using Artificial Intelligence For Reporting Side Effects Of Medicines** is a record of the research work undertaken by **Dr. Ritu Raj** in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

Faculty Guide: Vinod Kumar SV

IIHMR University, Jaipur

Date: 30th May 2023

School Dean: Dr. Mahendra Kumar

IIHMR University, Jaipur

Date: 30th May 2

Abstract

Introduction:
The reporting of medication side effects plays a crucial role in promoting patient safety and improving healthcare outcomes. However, the existing reporting system faces limitations and challenges, including underreporting and lack of user-friendly platforms. This study highlights the importance of patient reporting and explores strategies to overcome these limitations. Implementing efficient and user-friendly electronic reporting platforms, providing education and training to healthcare professionals and patients, and simplifying reporting procedures can enhance participation and accuracy. Additionally, integrating artificial intelligence (AI) and real-time monitoring can improve medication adherence, enable early detection of side effects, enhance symptom management, and deliver cost-effective care. This innovative approach has the potential to transform medication safety and enhance patient well-being.

Aim and Objective:
The objectives are to assess patient perceptions of AI's benefits, concerns, and contributions to drug safety monitoring and identify factors such as demographics, technology experience, trust, and ease of use. The study aims to advance drug safety practices by exploring AI's potential in enhancing adverse drug reaction reporting.

Methodology:
This study utilizes an online survey administered through Google Forms to investigate individuals' perspectives on reporting side effects of medicines and their willingness to accept new technologies for this purpose. A total of 250 participants were invited to participate through email invitations and social media platforms. The questionnaire comprises two sections, one focusing on demographic information, knowledge, attitudes, and perceptions related to side effect reporting, and the other assessing participants' openness to adopting new technologies for this task.

Conclusion:
The findings of this study shed light on various aspects related to the reporting of side effects of medicines. The prevalence of side effects among allopathic medicine users emphasizes the importance of monitoring and reporting such events. The low adoption of digital reporting methods indicates a potential area for improvement in promoting user-friendly reporting platforms. The perception that side effects were not significantly risky or hesitance to bother healthcare providers highlights the need for awareness campaigns and education on the significance of reporting. The study also reveals variations in telemedicine usage based on age and location, suggesting the need for targeted strategies to ensure equitable access to healthcare services. The positive attitude towards technology and AI among participants with higher education levels underlines the role of education in promoting AI literacy and preparing individuals to engage effectively with AI-driven healthcare solutions. Overall, the study provides insights for policymakers and healthcare stakeholders to enhance drug safety monitoring and promote the utilization of digital health technologies in a patient-centered manner.

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Chapter 1
Introduction

Ensuring the safety of medication is extremely important to ensure that patients receive the intended benefits without experiencing harm. Adverse drug events (ADEs) refer to the harms that can occur due to medication use, such as allergic reactions, side effects, overmedication, and medication errors. These events can cause harm to patients, increase healthcare costs, and even result in hospitalizations.[1]

It is crucial to report side effects accurately and promptly to improve drug safety and patient outcomes. Reporting side effects helps identify potential safety issues with medications and can lead to the development of new safety measures. Patients, healthcare providers, and pharmaceutical companies can report side effects to regulatory agencies like the *FDA's MedWatch program.* [1][2]

Recent studies have emphasized the importance of patients directly reporting adverse drug reactions [1]. Patients can provide valuable information on the severity of symptoms and the impact on their everyday lives. This information is often more comprehensive than reports from healthcare providers alone. Having an active management and effective reporting system is essential for detecting medication errors and promoting safe practices. The Institute for Safe Medication Practices maintains a list of high-alert medications that can cause significant harm if used incorrectly.[3]

Research has shown that patient reporting of ADRs can offer more complete and detailed information on drug safety compared to reports from healthcare providers. The introduction of pharmacovigilance (PV) obligations in the European Union has led to increased reporting of adverse reactions, with patient reports accounting for about 30% of the total reported reactions annually. [4]

Timely, complete, and accurate reporting of ADEs is vital for monitoring and improving patient safety. Preventing medication errors requires taking specific steps to ensure safety at each stage of the medication process. Clinical pharmacists play an important role in monitoring and detecting errors.

Overall, promoting and maintaining medication safety is crucial for patient well-being, and reporting ADEs is a vital part of this effort.[1][2]

The existing system for reporting medication side effects faces several limitations and challenges that need to be addressed to improve participation and enhance reporting accuracy. One major drawback is underreporting, where healthcare professionals often fail to report

side effects due to concerns about litigation, limited knowledge on reporting procedures, lack of awareness, and time constraints. Additionally, the current reporting system lacks user-friendly electronic platforms, making it difficult for healthcare professionals to access and complete the reporting forms, leading to decreased accuracy and participation. Another challenge lies in the length of the reporting form, as its extensive nature can discourage healthcare professionals from completing it thoroughly. Moreover, patient participation in reporting side effects is low, primarily due to a lack of knowledge about reporting mechanisms. To enhance the system, efforts should be directed towards addressing these limitations, simplifying reporting procedures, and raising awareness among healthcare professionals and patients alike.[5]

To overcome the limitations and challenges of the current system for reporting medication side effects, it is crucial to implement more efficient and user-friendly approaches. This can be achieved through the development of accessible electronic reporting platforms that are user-friendly for both healthcare professionals and patients [5]. Additionally, providing comprehensive education and training to healthcare professionals and patients on the reporting process can increase awareness and knowledge. Shortening the reporting form can also incentivize healthcare professionals to complete it more thoroughly and efficiently. Moreover, active efforts should be made to encourage patient participation in reporting by offering user-friendly tools and emphasizing the importance of their contributions. By implementing these strategies, the reporting of medication side effects can be enhanced, leading to improved patient safety and more accurate monitoring of adverse drug events. [6]The integration of AI and real-time monitoring in the context of medication side effects can significantly improve patient outcomes in several ways. Firstly, AI can enhance medication adherence by providing timely reminders to patients and monitoring their compliance. Real-time monitoring allows healthcare professionals to identify instances of non-adherence promptly, enabling interventions to prevent potential harm or complications. This proactive approach promotes better patient adherence, ultimately leading to improved treatment outcomes. [6]

Secondly, real-time monitoring facilitated by AI enables early detection of medication side effects. By continuously monitoring patients' responses to medications, AI systems can identify potential side effects as they arise. This timely detection empowers healthcare

professionals to take swift action, intervening promptly to prevent further harm and optimize patient safety. AI algorithms can analyse patterns and trends in side effects across patient populations, enabling healthcare providers to develop more informed strategies for medication selection and monitoring.[6]

Furthermore, real-time monitoring and AI-powered systems facilitate more effective symptom management. By capturing and analysing real-time data on patient symptoms, healthcare professionals can make informed decisions regarding medication adjustments, dosage modifications, or alternative treatment options. This personalized approach enhances symptom management, minimizing the impact of side effects and improving overall patient well-being.[6][7]

AI-based real-time monitoring has the potential to deliver cost-effective care. By detecting and managing medication side effects proactively, healthcare professionals can reduce the likelihood of hospitalizations and emergency department visits. This, in turn, alleviates the associated financial burden on patients and healthcare systems. By optimizing patient care and resource utilization, AI-driven real-time monitoring contributes to more efficient healthcare delivery. [6][7][8]

Studies have shown that the integration of AI and real-time monitoring in the reporting and management of medication side effects holds great promise for improving patient outcomes. By promoting medication adherence, enabling early detection of side effects, enhancing symptom management, and delivering cost-effective care, this innovative approach has the potential to transform medication safety and enhance patient well-being. [8][9]

Research questions:

1. What are the attitudes of patients/consumers towards using AI-based software for pharmacovigilance?
2. What factors influence the acceptance or rejection of AI-based software for pharmacovigilance among patients/consumers?
3. How do patients/consumers perceive the potential impact of AI-based software on drug safety and adverse reaction monitoring?

Objectives:

1. To assess the attitudes of patients/consumers towards the utilization of AI-based software for pharmacovigilance and understand their perceptions regarding its benefits, concerns, and potential contributions to drug safety monitoring.

2. To identify the factors that influence the acceptance or rejection of AI-based software for pharmacovigilance among patients/consumers, including demographic factors, previous experiences with technology, level of trust in AI, and perceived ease of use

Rationale of the study:

The study aims to contribute to the advancement of drug safety practices by exploring the potential role of AI in enhancing adverse drug reaction reporting.

Chapter 2
Review of Literature

AUTHOR	TITLE	OBJECTIVE	FINDINGS	CONCLUSION
Yu-Lin Huang et al 2014	A Comparison of Active Adverse Event Surveillance Systems Worldwide	To identify active surveillance systems worldwide that use existing data for the detection of ADEs.	Active surveillance systems for adverse drug events remain rare, but electronic health data are likely to increase the feasibility of active surveillance	The paper presents an inventory of global initiatives exploring large-linked databases for collecting data on drug safety. These systems currently supplement adverse drug event reporting by enhancing safety signals. Generating signals without specific research questions is not yet widely available, but growing informatics capacities will strengthen post-licensing drug safety evaluation
Lorna Hazell et al 2012	Under-Reporting of Adverse Drug Reactions	To estimate the extent of under-reporting of adverse drug reactions (ADRs) to spontaneous reporting systems	A total of 37 studies from 12 countries were identified, providing 43 numerical estimates of	The review highlights the need for further investigation into the impact of under-reporting on public health

		and to investigate whether there are differences between different types of ADRs.	under-reporting. The median under-reporting rate across all studies was 94%, indicating significant and widespread under-reporting. There was no significant difference in under-reporting rates between general practice and hospital-based studies	decisions and the effectiveness of interventions to enhance reporting, such as internet reporting and improved healthcare professional education
Benjamin Kompa et al 2022	Artificial Intelligence Based on Machine Learning in Pharmacovigilance: A Scoping Review	To understand how it is used for pharmacovigilance tasks, characterize differences with other fields, and identifyopportunities to improve pharmacovigilance with machine learning.	Only a small proportion (10%) of the studies aligned with current best practices and trends in machine learning. Similarly, in the subset of papers specifically addressing data intake and ingestion, only 19% incorporated these best practices.	Advances from artificial intelligence have yet to fully penetrate pharmacovigilance, although recent studies show signs that this may be changing.

Juergen Schmider et al 2018	Innovation in Pharmacovigilance: Use of Artificial Intelligence in Adverse Event Case Processing	To examine the viability of automating the processing of reports of adverse events using robotic process automation and artificial intelligence.	AI-based technology can be used to facilitate extraction from AE source documents and case validity assessment.	It is feasible to train the machine-learning algorithms using the safety database data fields as a substitute for the direct annotation of source documents, which would otherwise take a lot of time and money.
Vivekanandan Kalaiselvan et al 2014	Adverse drug reactions reporting culture in Pharmacovigilance Programme of India	The study analyses Individual Case Safety Reports received by the National Coordination Centre (NCC) between July 2011 and December 2012.	It reveals that physicians contributed the highest number of ADR reports (64.4%), followed by pharmacists (15.1%) and other healthcare professionals (20.4%). Government medical institutions showed a higher reporting rate (74.4%) compared to non-government medical institutions	The study emphasizes the need for increased awareness and active participation of healthcare professionals in ADR reporting to improve pharmacovigilance.

			(24.5%) and corporate hospitals (1.0%).	
Chetna K. Desai et al 2011	An evaluation of knowledge, attitude, and practice of adverse drug reaction reporting among prescribers at a tertiary care hospital	This study aimed to assess the knowledge, attitude, and practices (KAP) regarding adverse drug reaction (ADR) reporting among prescribers at Civil Hospital, Ahmedabad	Most respondents considered ADR reporting important for patient safety and identifying new ADRs. However, only 15% had previously reported ADRs, citing lack of information and access to reporting forms as barriers.	Increasing awareness and simplifying the reporting process may enhance spontaneous reporting of ADRs.
Caroline Lacoste-Roussillon et al 2001	Incidence of serious adverse drug reactions in general practice: A prospective study	This study aimed to estimate the incidence of serious adverse drug reactions (ADRs) in general practice	Thirteen validated serious ADRs, including two fatal cases, were observed during the study period, resulting in an incidence density of 10.2 per 1000 days of practice. The average rate was 2.6 cases per general practitioner per year, extrapolating to approximately	These findings emphasize the significance of serious ADRs in general practice and their impact on public health.

			123,000 ADR cases for all general practitioners in France. Antineoplastics and anticoagulants were frequently implicated, with blood dyscrasia and bleeding being the most common ADRs	
F Hammann et al 2010	Prediction of Adverse Drug Reactions Using Decision Tree Modelling	Study aimed to analyse the structure-activity relationship of adverse drug reactions (ADRs) in the central nervous system (CNS), liver, kidney, and allergic reactions for a diverse range of drugs.	The models developed demonstrated high predictive accuracies (78.9% to 90.2%) for different types of ADRs.	The study highlights the potential of using simple models to predict complex drug effects, aiding in drug selection, understanding drug interactions with target organs, and enhancing post-marketing drug surveillance and pharmacovigilance efforts.
Likeng Liang et al 2022	Artificial Intelligence-Based Pharmacovigilance in the Setting of Limited Resources	To address the challenges of implementing AI-based systems in resource-limited	Solutions such as enhancing data collection, providing training and education, and	Future advancements in collaborative research networks, pharmacogenomic

		settings.	promoting the benefits of AI-based pharmacovigilance can contribute to improving the effectiveness of pharmacovigilance in resource-limited settings.	research, and advanced machine learning algorithms hold promise for enhancing AI-based pharmacovigilance in these settings.
Kotni Murali et al 2019	Artificial intelligence in pharmacovigilance: Practical utility	To create awareness about AI in Pharmacovigilance	Utilizing the data fields from the safety database as a substitute for directly annotating source documents can be a practical approach to training machine-learning algorithms. This strategy saves time and reduces costs associated with the manual annotation process.	In the future, the field of drug safety is expected to advance significantly through the implementation of AI techniques. There is a growing need for further research and exploration of AI in the context of pharmacovigilance (PV). Currently, AI, databases, and tools related to PV are in the early stages of development, but they hold great potential for advancement. As

				these technologies continue to evolve and improve, they are likely to play a crucial role in enhancing the field of PV and revolutionizing drug safety practices.

Chapter 3
Methodology

RESEARCH DESIGN	Cross Sectional Survey
SETTING	The study will be conducted through an online survey administered via Google Forms, a widely used online survey platform. The survey was sent to 250 individuals and was accessible through a direct link shared via email invitations and social media platforms. The survey was open to participants from various regions and was active from April 25th to May 15th, 2023. Participant engagement was voluntary, and no incentives were provided. Ethical considerations were addressed by obtaining informed consent from participants at the beginning of the survey, ensuring the anonymity and confidentiality of responses, and adhering to relevant data protection regulations.
STUDY SAMPLE	**Inclusion Criteria:**
	1. Patients/consumers: Individuals who have used prescribed medications in Allopathy. 2. Age: Adults (18 years and above) who can provide informed consent. 3. Language: Participants who are proficient in the language of the survey (e.g., English) to ensure accurate understanding and response.
	Exclusion Criteria:
	1. Healthcare professionals: Individuals who work in healthcare professions (e.g., doctors, pharmacists, nurses) to focus on the perspectives of patients/consumers. 2. Age: Individuals below the age of 18 to comply with ethical considerations and consent requirements. 3. Limited medication experience: Individuals who have not used prescribed medication in Allopathy.

SAMPLE SIZE	185 (N: 250, p: 50%, CI: 95%, Margin of error: 0.072%)
SAMPLING METHOD	Random Sampling
DATA COLLECTION	• **Data Collection Method**: Survey • **Data Collection Tool:** Questionnaire divided into two sections; first section assessing demographic details, knowledge regarding reporting of side effects, attitudes, and perceptions; second section assessing if they will be willing to accept new technologies for the reporting of side effects of medicines. • **Data Collection Procedures:** The study will be conducted through an online survey administered via Google Forms, a widely used online survey platform. The survey will be accessible through a direct link shared via email invitations and social media platforms. The survey will be open to participants from various regions and was active from May 1st to May 15th, 2023. Participant engagement would be voluntary, and no incentives were provided. Ethical considerations would be addressed by obtaining informed consent from participants at the beginning of the survey, ensuring the anonymity and confidentiality of responses, and adhering to relevant data protection regulations.
DATA ANALYSIS	• Software or Statistical Packages Used : SPSS, EXCEL • Statistical Analysis Techniques: Chi-square test
ETHICAL	• Informed Consent Process • Protection of Participants' Rights and Privacy

CONSIDERATIONS	
BIAS & LIMITATIONS	• **Potential Bias:** 1. Self-Selection Bias 2. Social Desirability Bias 3. Recall Bias • **Constraints or Limitations of the Study:** 1. Limited Sample Size 2. Limited Control over External Factors 3. Reliance on Self-Reported Data 4. Limited Generalizability and Representation
VALIDITY	• **Internal Validity:** 1. Individual characteristics 2. Prior experiences 3. External influences that may affect participants' perception. • **External Validity:** 1. Specific target population

Chapter 4
Results

The data analysis for this study was conducted using the software SPSS. Various statistical techniques were employed, including descriptive analysis to summarize the characteristics of the data, cross tabs to examine the relationships between categorical variables, chi-square test to assess the association between categorical variables, and correlations to examine the relationships between continuous variables.

The questionnaire used in the study consisted of 29 variables covering a range of topics. These variables included demographic details, attitude assessment questions, usage of telemedicine and smartphones, trust in social media, and information regarding rural or urban area of residence. Additionally, the questionnaire contained perception assessment questions aimed at identifying attitudes towards telemedicine, the importance of reporting side effects, and perceptions of AI-based software. These variables were designed to gather data on various aspects related to telemedicine, technology usage, attitudes, and perceptions of participants.

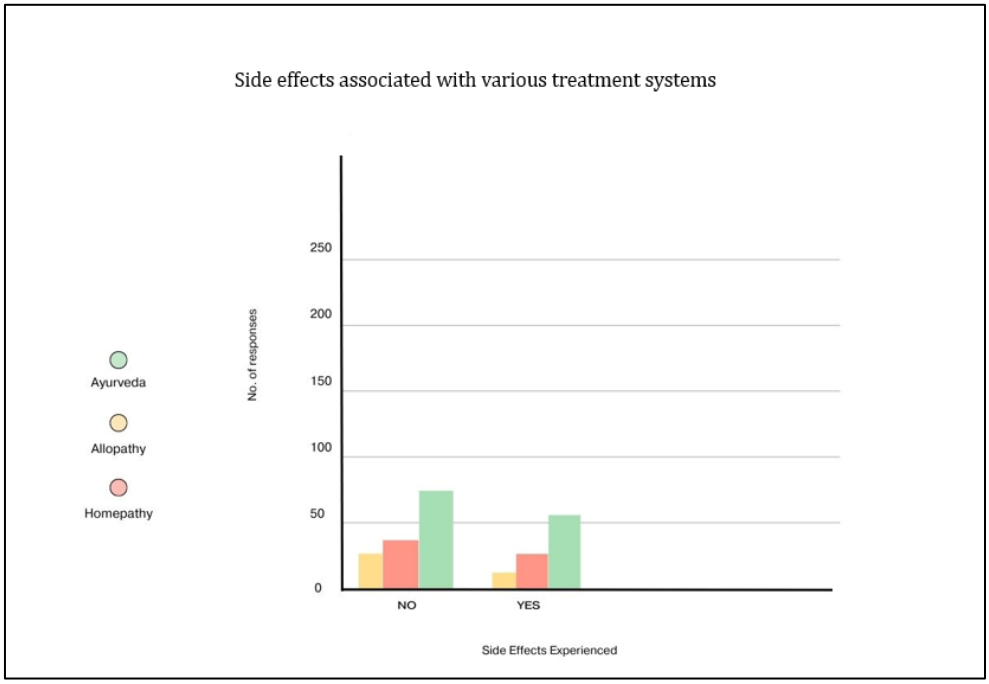

Fig 4.1 *refers to the type of medic treatment the participants willingly take and if they experienced any side effects.* *(24 respondents who reported as "uncertain" were removed from N=185) **

Among the 161* respondents, approximately 65% reported using allopathic medicines. Out of this group, approximately 43% of the respondents experienced side effects from the allopathic medicines. On the other hand, the remaining respondents utilized alternative medical treatments such as Homeopathy and Ayurveda, which were reported to have no significant side effect experiences.

Type of Medical Treatment Undertaken and Reporting of side effects					
		Side effect reported			Total
			No	Yes	
Medical treatment		Allopathy	31	36	67
		Ayurveda	4	0	4
		Homeopathy	10	6	16
		Others	6	4	10
	Total				97

Table 4.1 *represents the type of medical treatment the participants willingly take and if they reported the experienced side effects. (88 "uncertain responses were removed, making N=97)*

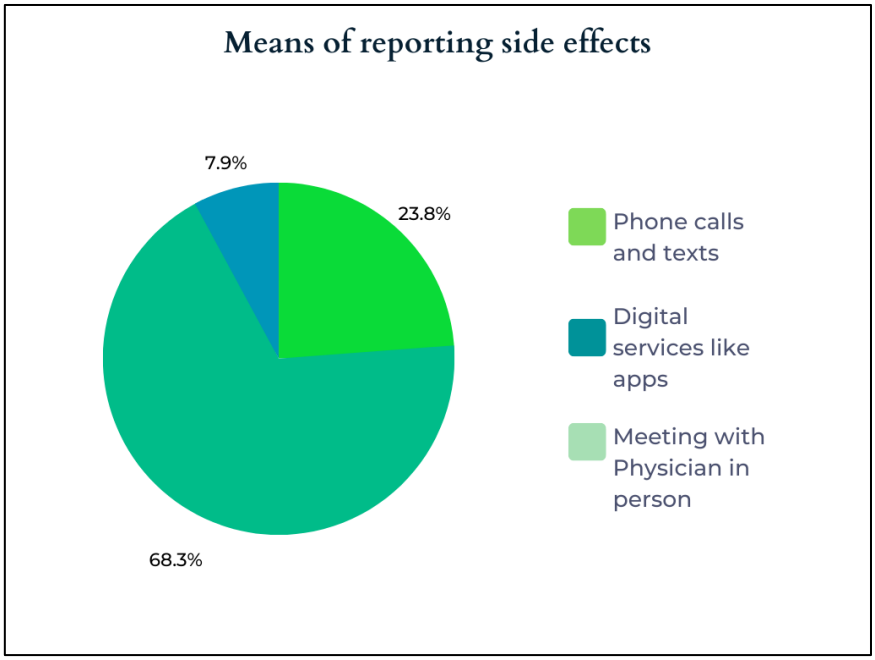

Fig 4.2 *represents the means and method used by the consumer to report side effects.*

Among the group of respondents who reported using allopathic medicines, approximately 25% did not disclose any experienced side effects. Of the users who reported side effects, 68% chose to directly meet the physician in person to discuss their concerns, while the remaining respondents opted to utilize mobile services for reporting. Only a small portion (7%) of the respondents relied on digital services, such as apps and other software, to report their experiences with the medicines.

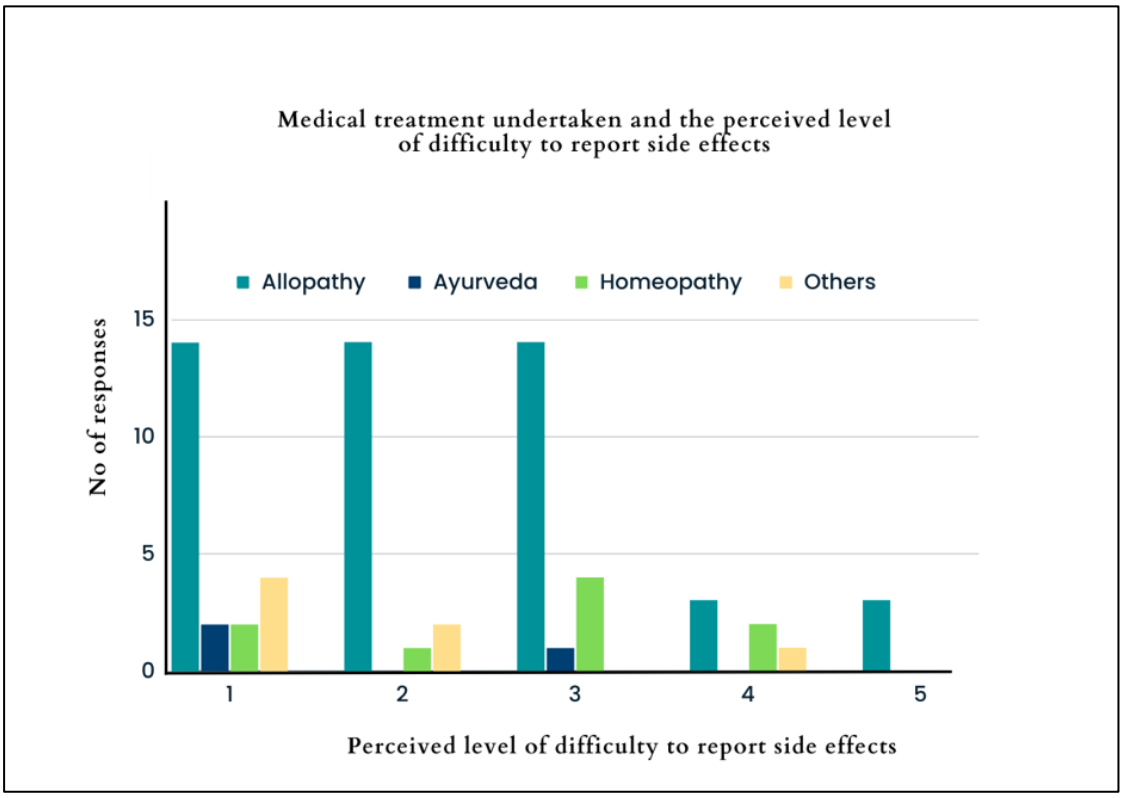

Fig 4.3 *demonstrated level of difficulty in reporting the side effects.*

Interestingly, a significant number of participants found the level of difficulty in reporting to be relatively insignificant. Many participants expressed that the process of reporting was comparatively easy and did not pose significant challenges.

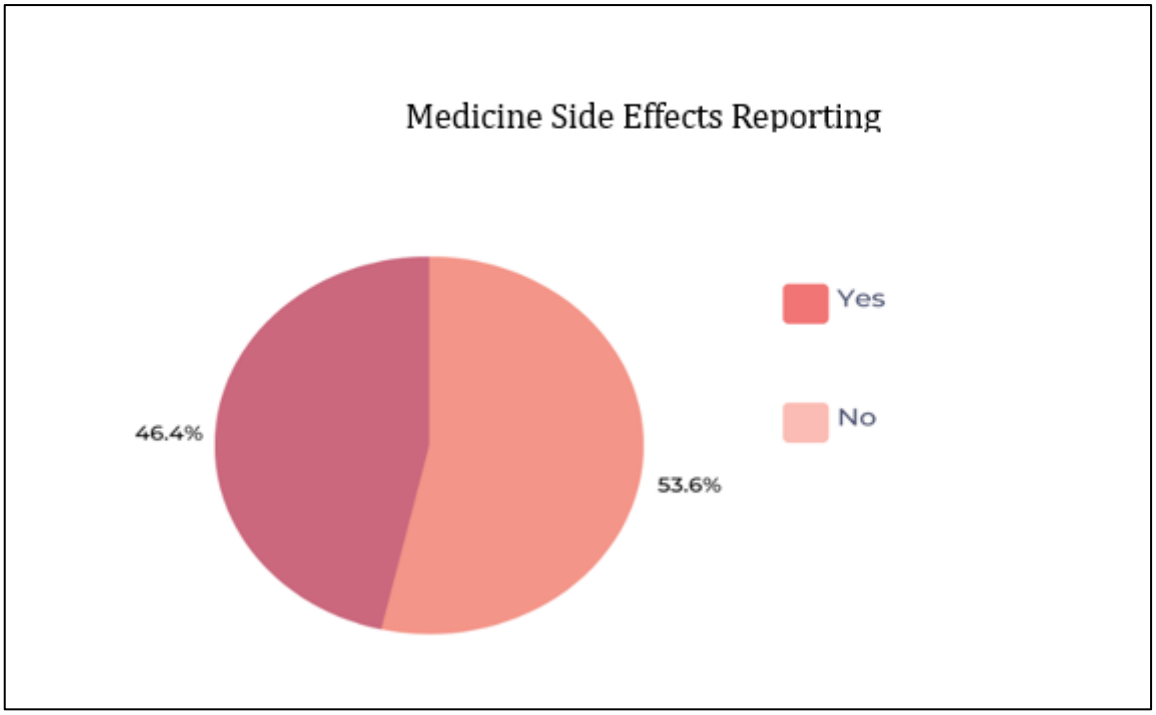

Fig 4.4 *illustrates the reporting of side effects of medicine based on a sample population*

Out of 185 respondents, 53% did not report the side effects of any type of medical treatment that they pursued.

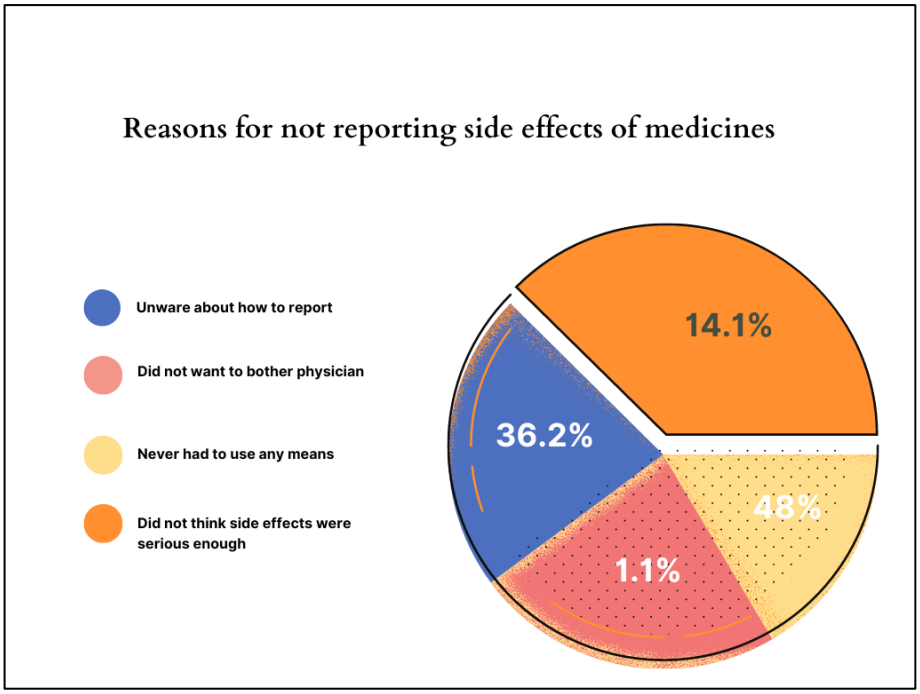

Fig 4.5 *presents the reasons for not reporting side effects and the corresponding explanations provided by the respondents.*

Figure 3.5 indicates that among the respondents who did not report side effects, approximately 50% believed that the side effects were not significantly risky. On the other hand, the remaining 50% expressed the perception that they should not bother their physicians or healthcare providers with their concerns about the side effects. This division in reasons highlights the different perspectives and attitudes among respondents regarding the reporting of side effects.

The questionnaire included a question to determine whether participants resided in a rural or urban area. This information helped in assessing potential differences in access to healthcare services and technology between rural and urban populations. Age was also included the survey to understand what distribution of population use telemedicine services the most.

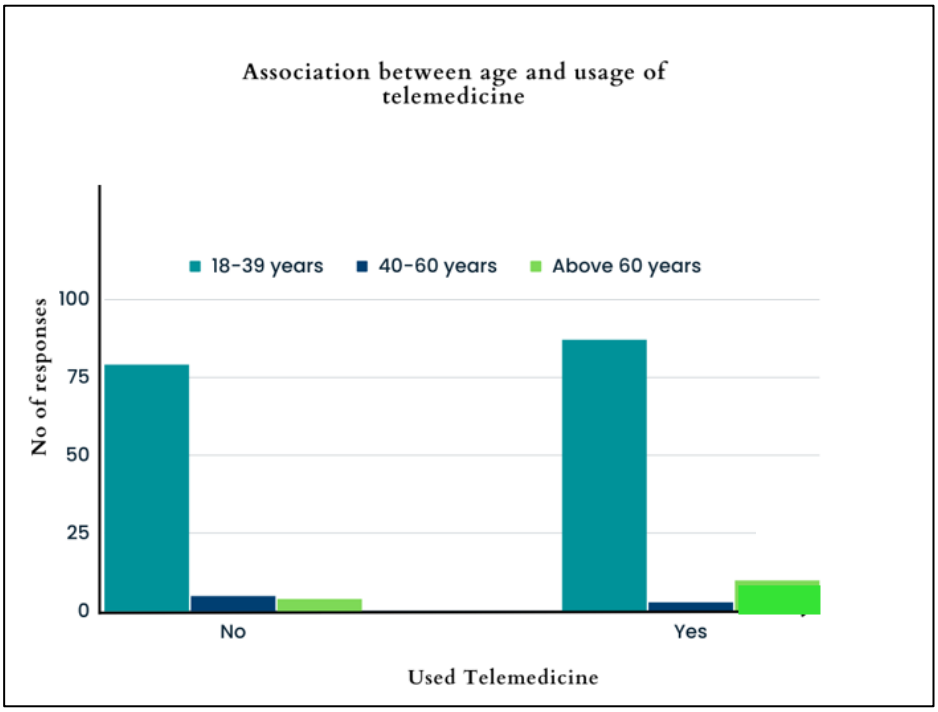

Fig 4.6 *represents the relationship between age of respondents and the usage of telemedicine.*

Many of the respondents were between the ages of 18 to 39 year (89%). It is seen that more than half of the respondents of this age group (52%) used telemedicine services. Not even 10% of the respondents from the age group of 40 to 60 years old used telemedicine services.

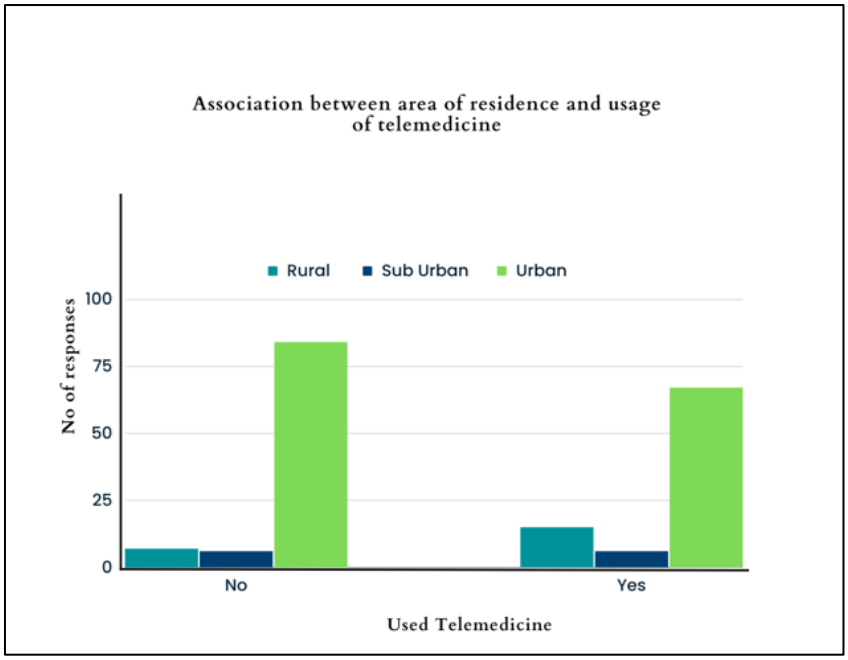

Fig 4.7 *represents the relationship between area of residence of respondents and the usage of telemedicine.*

11% of the survey population resided in the rural areas and only 32% of these respondents' used telemedicine. Mainly urban area population utilized telemedicine services.

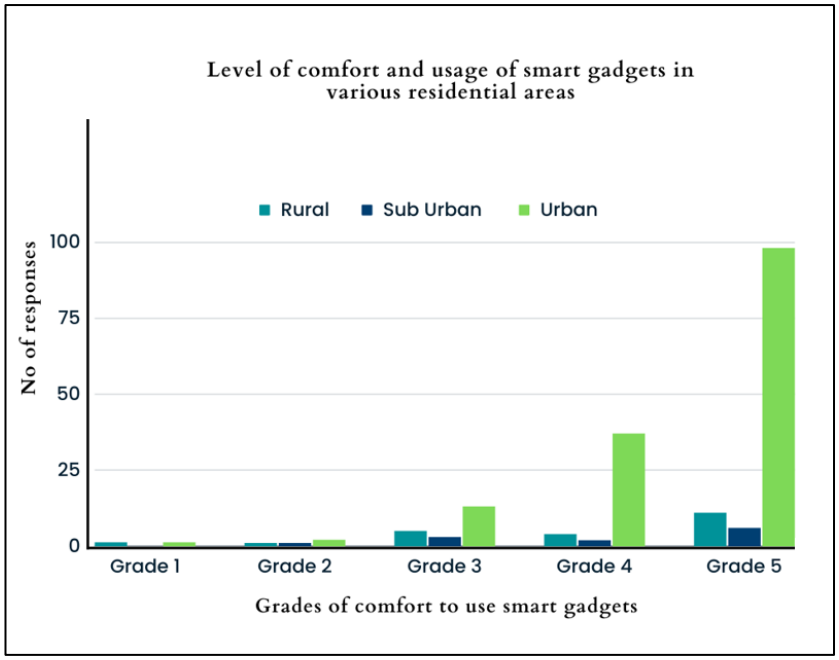

Fig 4.8 *represents the level of comfort to use smart gadgets like phones, laptops, computers etc in various areas of residence of respondents.*

Figure 3.8 illustrates that less than 10% of the respondents, both from rural and urban areas, expressed feelings of uneasiness or discomfort when using smart gadgets. This suggests that the majority of the participants, regardless of their location, reported feeling at ease and comfortable while utilizing smart gadgets.

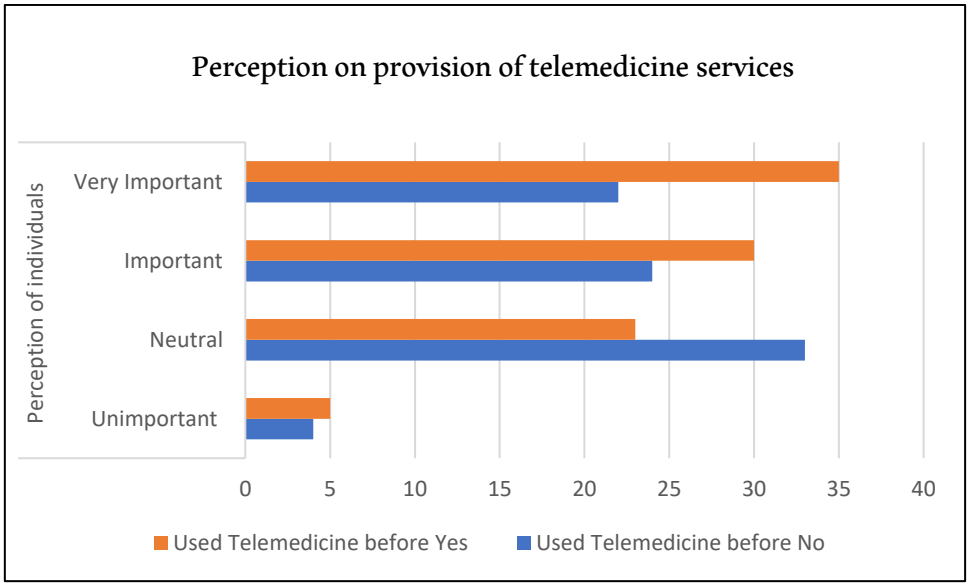

Fig 4.9 *Perception on provision of telemedicine services by respondents who have previously utilized and not utilized the services from healthcare providers.*

The table above presented demonstrates the perception of respondents regarding the provision of telemedicine services by healthcare providers (HCPs). It indicates a correlation between the respondents' utilization of telemedicine services and their perception of its future availability. The data suggests that individuals who have used telemedicine services hold a strong belief that such services should be continued and offered in the future.

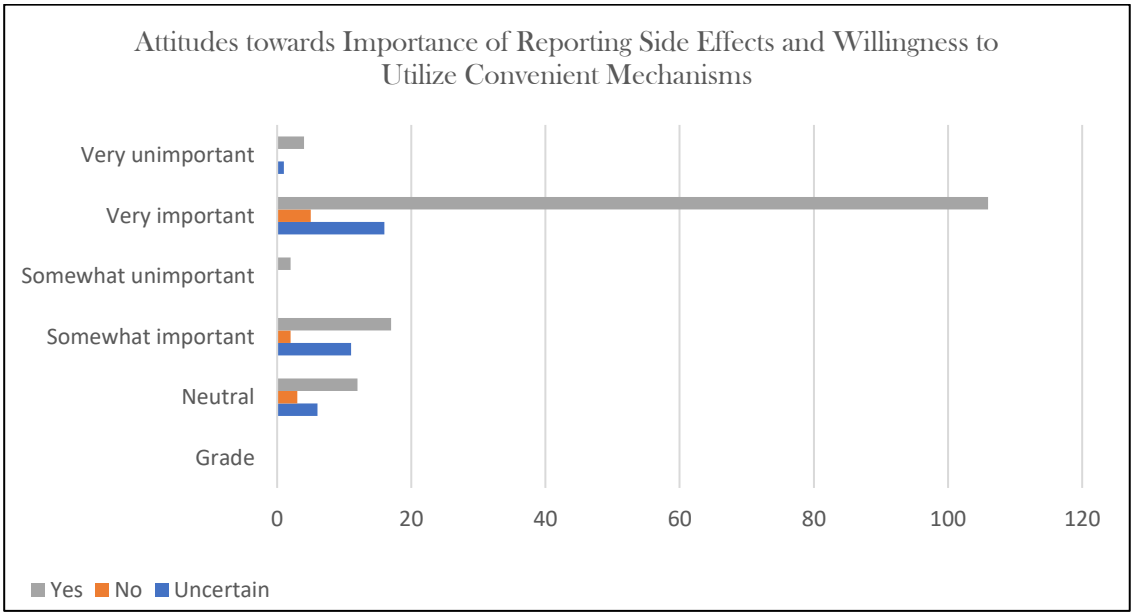

Fig 4.10 *Attitudes towards Importance of Reporting Side Effects and Willingness to Utilize Convenient Mechanisms*

In Table 3.10, the data reveals that among the respondents who consider it very important to report side effects (70% of the total), a significant majority (83%) expressed their willingness to report side effects if there was an easy and convenient reporting mechanism available.
On the other hand, less than 10% of the participants held the belief that reporting side effects is not valuable.

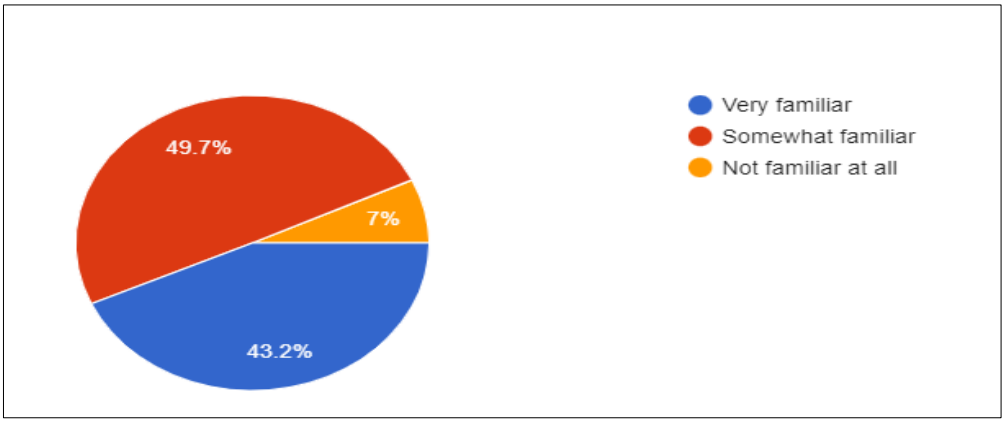

Fig 4.11 *Participants' Familiarity with Artificial Intelligence (AI) Concepts*

The data presented indicates that approximately 50% of the participants reported being somewhat familiar with the concept of Artificial Intelligence (AI). Furthermore, the data reveals that only 7% of the participants indicated a lack of knowledge or idea about the concept of AI.

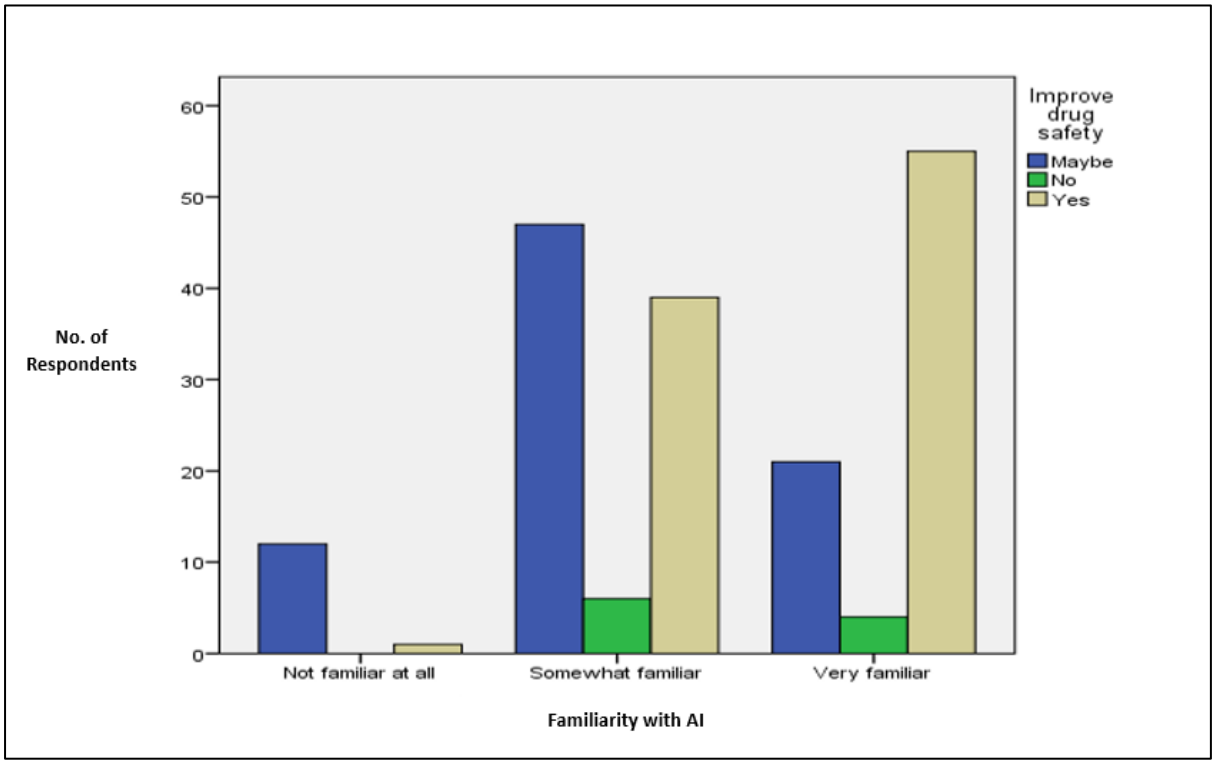

Fig 4.12 *demonstrates prior understanding of AI and its association with perceptions on drug safety.*

The data presented suggests that participants who reported being somewhat familiar or very familiar with the concept of Artificial Intelligence (AI) generally hold the belief that AI can enhance drug safety.

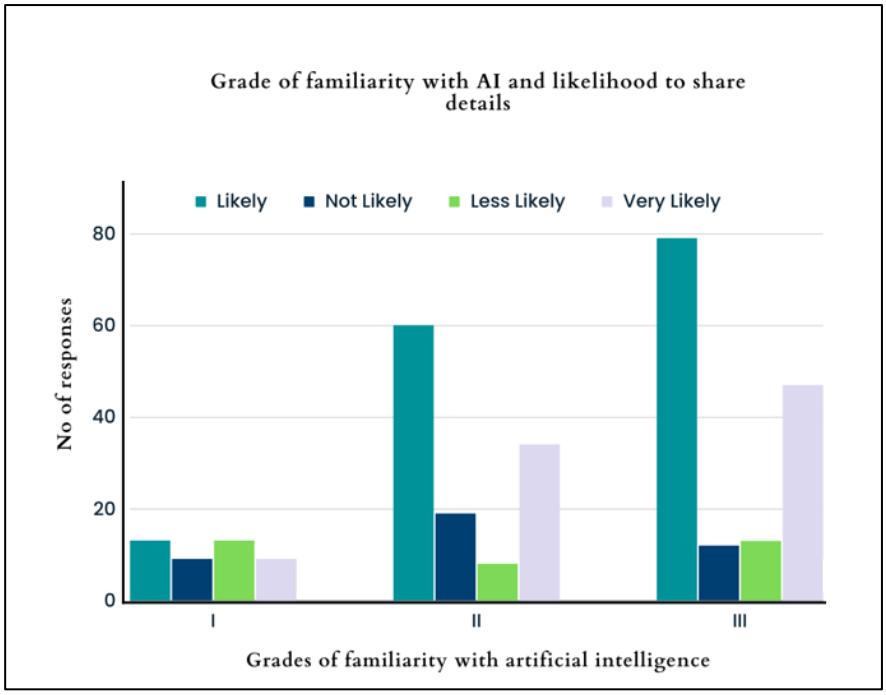

Fig 4.13 *present grade of familiarity with artificial intelligence and respondents' likelihood to share details.PS: Grade I- No understanding; Grade-II Fair understanding; Grade-III Good understanding. **

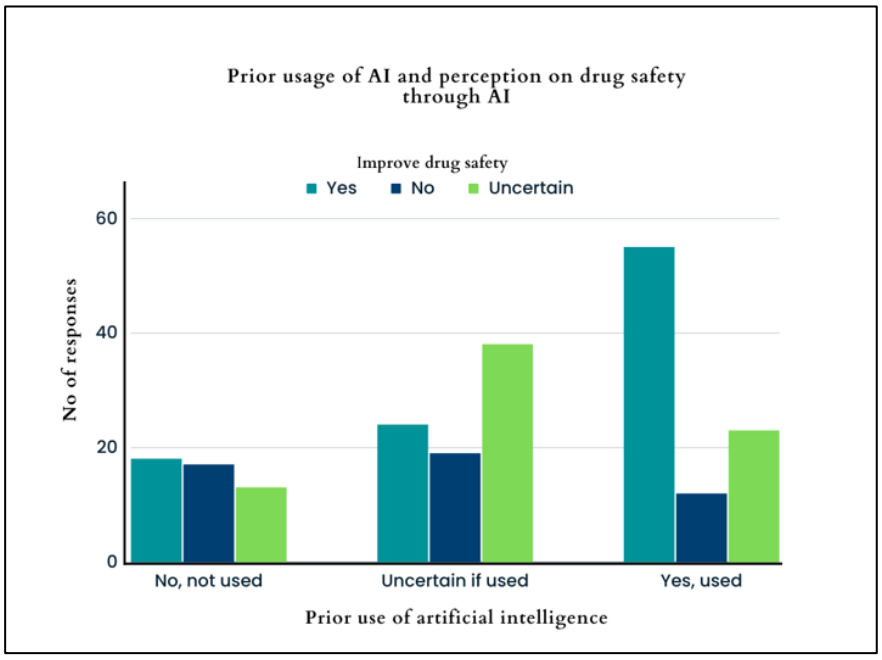

Fig 4.14 *demonstrates prior use of AI and its association with perceptions on drug safety.*

Based on the data presented above, participants who reported being somewhat familiar or very familiar with the concept of Artificial Intelligence (AI) and believed in its potential to enhance drug safety may indeed be more inclined to share their details and information with software or applications.

The data indicates that individuals who have prior experience using artificial intelligence software believe that this technology has the potential to enhance drug safety and improve the reporting of adverse drug reactions.

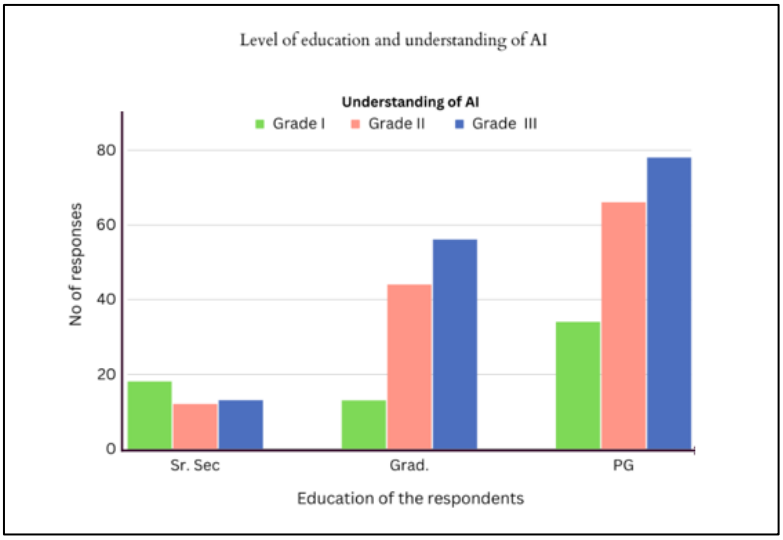

Fig 4.15 *demonstrates level of education and understanding of AI. (Pearson Chi Sq =18.6; p value = 0.05) PS: Grade I- No understanding; Grade-II Fair understanding; Grade-III Good understanding. **

The data in Figure 3.10 indicates that there is a significant relationship between level of education and awareness and familiarity with artificial intelligence.

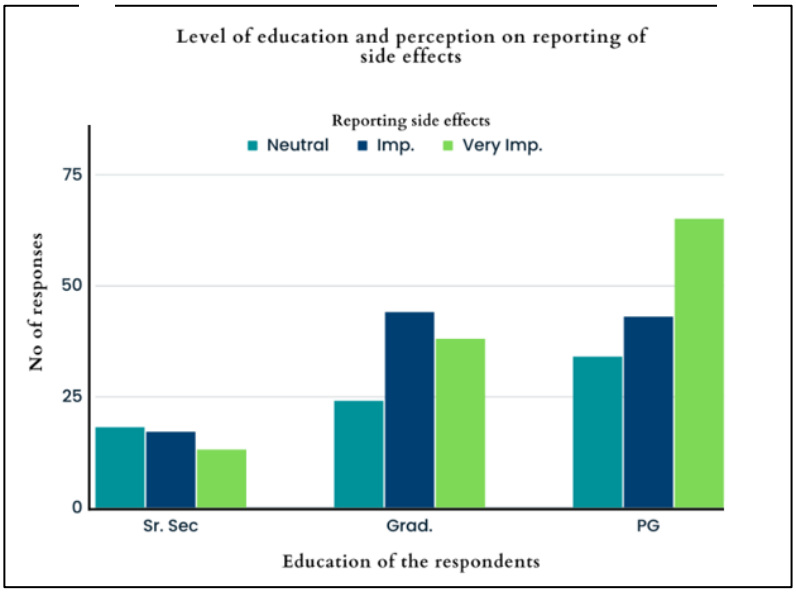

Fig 4.16 *demonstrates level of education and perception on reporting of adverse drug effects. (Pearson Chi Sq = 23.4; p value < 0.01)*

Based on the information provided, the graph suggests that individuals who have completed their education until graduation and above are more likely to have a perception that it is very important to report side effects of medicines. This finding indicates a positive correlation between the level of education and the perception of the importance of side effect reporting. The statistical evidence supports the notion that the level of education and the perception of the importance of side effect reporting are associated.

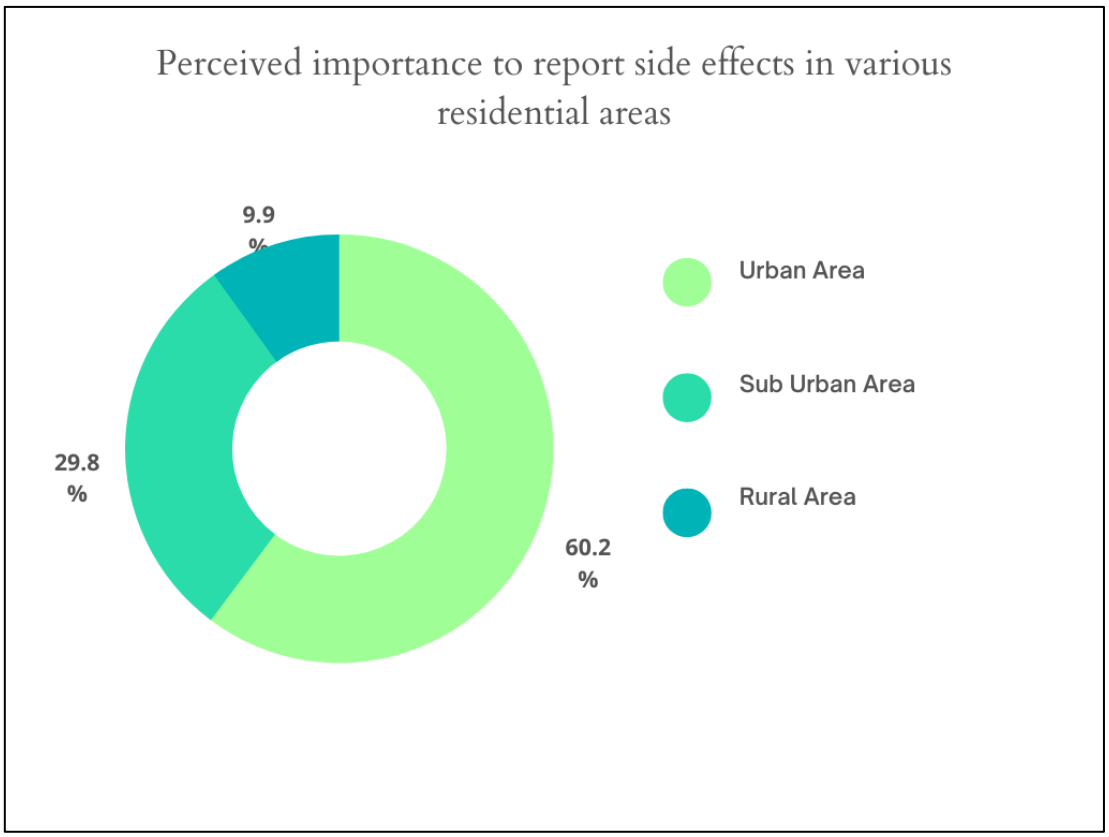

Fig 4.17 *demonstrates area of residence and perception on reporting of adverse drug effects. (Pearson Chi Sq = 18.5; p value < 0.05)*

It was also noted that area of residence was significantly of value when we asked about reporting of the side effects. Rural Area residents and Sub Urban Area residents did not exhibit the awareness of reporting side effects and its importance.

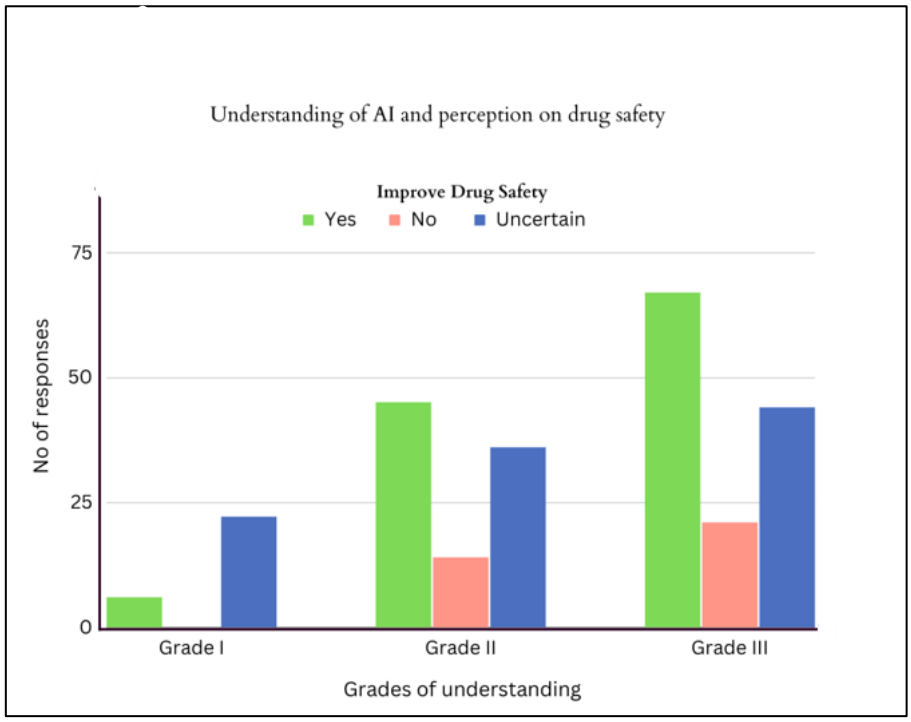

Fig. 4.18 *demonstrates understanding of AI and perception on drug safety. (Pearson Chi Sq = 25.4; p value < 0.01) PS: Grade I- No understanding; Grade-II Fair understanding; Grade-III Good understanding.*

*

It is of importance to acknowledge the fact that people who were familiar with and had the awareness of artificial intelligence thought that ai software can improve drug safety. The relationship between these two variables is statistically significant. (p value: 0.000).

People showed their interest in the fact that if there was an easy and convenient way to report the side effects, they would have. More than 50% thought that they didn't know how to report the side effects.

If approximately 75% of the respondents who have used telemedicine services reported that they would use an easy and convenient method to report side effects.

Chapter 5
Discussion

The study found that a significant percentage of participants (68%) reported using allopathic medicines, while the remaining participants opted for alternative medical treatments. Among allopathic medicine users, approximately 37% experienced side effects. This highlights the importance of monitoring and reporting side effects in the context of allopathic medicine usage. The data showed that a portion of participants (25%) who experienced side effects from allopathic medicines did not report them. However, among those who did report side effects, the majority (68%) chose to directly meet their physicians in person. This emphasizes the role of traditional healthcare channels in reporting side effects. Interestingly, only a small percentage (7%) utilized digital services such as apps or software for reporting. The relatively low adoption of digital reporting methods could be a topic for further investigation.

The data revealed that approximately 50% of participants who did not report side effects believed that the side effects were not significantly risky. The other 50% expressed the perception that they should not bother their physicians or healthcare providers with their concerns. These findings shed light on the various factors influencing participants' decisions not to report side effects and highlight the need for effective communication and education regarding the importance of reporting.

It was also found that many respondents are in the age group of 18 to 39 (89%) utilized telemedicine services, while the usage was considerably lower (less than 10%) among respondents aged 40 to 60. Additionally, a higher percentage of participants residing in urban areas utilized telemedicine services compared to those in rural areas. These findings suggest potential variations in access to and acceptance of telemedicine services based on age and location, which could have implications for healthcare service planning and resource allocation.

The data indicated that most of the respondents, both in rural and urban areas, reported feeling at ease and comfortable when using smart gadgets. This suggests a positive perception of technology and a readiness to embrace digital tools in healthcare, which could facilitate the adoption of telemedicine and other digital health solutions.

Participants who had used telemedicine services expressed a strong belief that such services should be continued and offered in the future. This indicates a positive attitude towards telemedicine and highlights the importance of maintaining and expanding telemedicine initiatives to meet the expectations and needs of patients.

The study found that participants who reported being somewhat familiar or very familiar with the concept of AI generally believed that AI has the potential to enhance drug safety. This suggests a recognition of the benefits and value of AI in the context of drug safety and surveillance.

Table 3.11 and the accompanying graph show a significant relationship between the level of education and awareness/familiarity with artificial intelligence (AI), it suggests that individuals with higher levels of education tend to have greater awareness and familiarity with AI compared to those with lower levels of education.
This finding highlights the role of education in shaping people's knowledge and understanding of AI. It suggests that individuals who have received higher education may have had more exposure to AI concepts and technologies, leading to increased awareness and familiarity.

The significance of this relationship is important as it implies that educational institutions and programs can play a crucial role in promoting AI literacy and preparing individuals to effectively engage with AI-related technologies and applications. It also underscores the need for targeted educational initiatives to bridge the knowledge gap and ensure that individuals from all educational backgrounds can benefit from and contribute to the advancements in AI.

Individuals who have completed their education until graduation and above are more likely to have a perception that it is very important to report side effects of medicines. This finding indicates a positive correlation between the level of education and the perception of the importance of side effect reporting.
The statistical evidence supports the notion that the level of education and the perception of the importance of side effect reporting are associated. This implies that individuals with higher levels of education may have a better understanding of the potential risks and benefits of medications, leading to a heightened awareness of the significance of reporting side effects.

However, it's important to consider that correlation does not imply causation. While there is a statistical association between education level and the perception of side effect reporting, other factors could also influence this relationship. Additional research and analysis would be

needed to further explore the underlying reasons for this correlation and to determine the extent to which education directly influences the perception of side effect reporting. approximately 75% of the respondents who have used telemedicine services reported that they would use an easy and convenient method to report side effects, it suggests a high level of willingness and interest among telemedicine users to utilize such a reporting mechanism. This finding highlights the potential benefits of implementing a streamlined and user-friendly system for reporting side effects within the telemedicine platform. It indicates that providing an accessible and efficient reporting option could encourage more telemedicine users to actively report their experiences with side effects, contributing to improved pharmacovigilance and drug safety monitoring.

Overall, the findings discussed above emphasize the importance of effective communication, education, and accessibility in healthcare systems. They also highlight the role of technology, such as telemedicine and AI, in improving drug safety and patient experiences. The study provides valuable insights for policymakers, healthcare providers, and researchers to further enhance drug safety evaluation, adverse drug reaction reporting, and the utilization of digital health technologies.

Chapter 6
Conclusion

In conclusion, the findings from this study provide valuable insights into various aspects related to drug safety, adverse drug reaction reporting, telemedicine usage, and perceptions of artificial intelligence (AI) in healthcare. The study revealed that a significant percentage of participants reported using allopathic medicines, with approximately 37% experiencing side effects. This highlights the importance of monitoring and reporting side effects in the context of allopathic medicine usage. It was observed that a portion of participants did not report side effects, and among those who did, the majority chose to directly meet their physicians in person. This emphasizes the role of traditional healthcare channels in reporting side effects, while the adoption of digital reporting methods was relatively low.

The reasons for not reporting side effects varied, with approximately 50% of participants perceiving the side effects as not significantly risky, and the other 50% feeling hesitant to bother their healthcare providers. These findings underscore the need for effective communication and education to raise awareness about the importance of reporting side effects. Encouraging patients to report side effects, regardless of perceived risk, can contribute to a more comprehensive understanding of drug safety profiles and facilitate timely interventions.

The study also examined telemedicine usage, revealing that a higher proportion of younger participants utilized telemedicine services compared to older participants. Additionally, urban areas had higher telemedicine utilization rates compared to rural areas. These findings suggest variations in access to and acceptance of telemedicine services based on age and location. Policymakers and healthcare providers should consider these factors when planning and allocating resources to ensure equitable access to telemedicine services for all populations.

The positive perception of smart gadgets among participants, regardless of their location, indicates a readiness to embrace digital tools in healthcare. This bodes well for the adoption of telemedicine and other digital health solutions, as patients feel comfortable using technology for their healthcare needs. Moreover, participants who had used telemedicine services expressed a strong belief in their continuation and future availability, highlighting the importance of maintaining and expanding telemedicine initiatives to meet patient expectations and needs.

Furthermore, participants who reported being familiar with the concept of AI generally held the belief that AI has the potential to enhance drug safety. This recognition of AI's benefits and value in the context of drug safety and surveillance highlights the importance of incorporating AI-based solutions in pharmacovigilance and adverse drug reaction reporting. Leveraging AI technology can help identify patterns, detect adverse events more efficiently, and ultimately improve patient safety.

Overall, the findings underscore the importance of effective communication, education, and accessibility in healthcare systems. They highlight the role of technology, such as telemedicine and AI, in improving drug safety and patient experiences. Policymakers, healthcare providers, and researchers can utilize these insights to enhance drug safety evaluation, adverse drug reaction reporting, and the utilization of digital health technologies. By addressing barriers to reporting side effects, expanding telemedicine services, and leveraging AI technology, healthcare systems can foster a safer and more patient-centric approach to healthcare delivery.

Chapter 7
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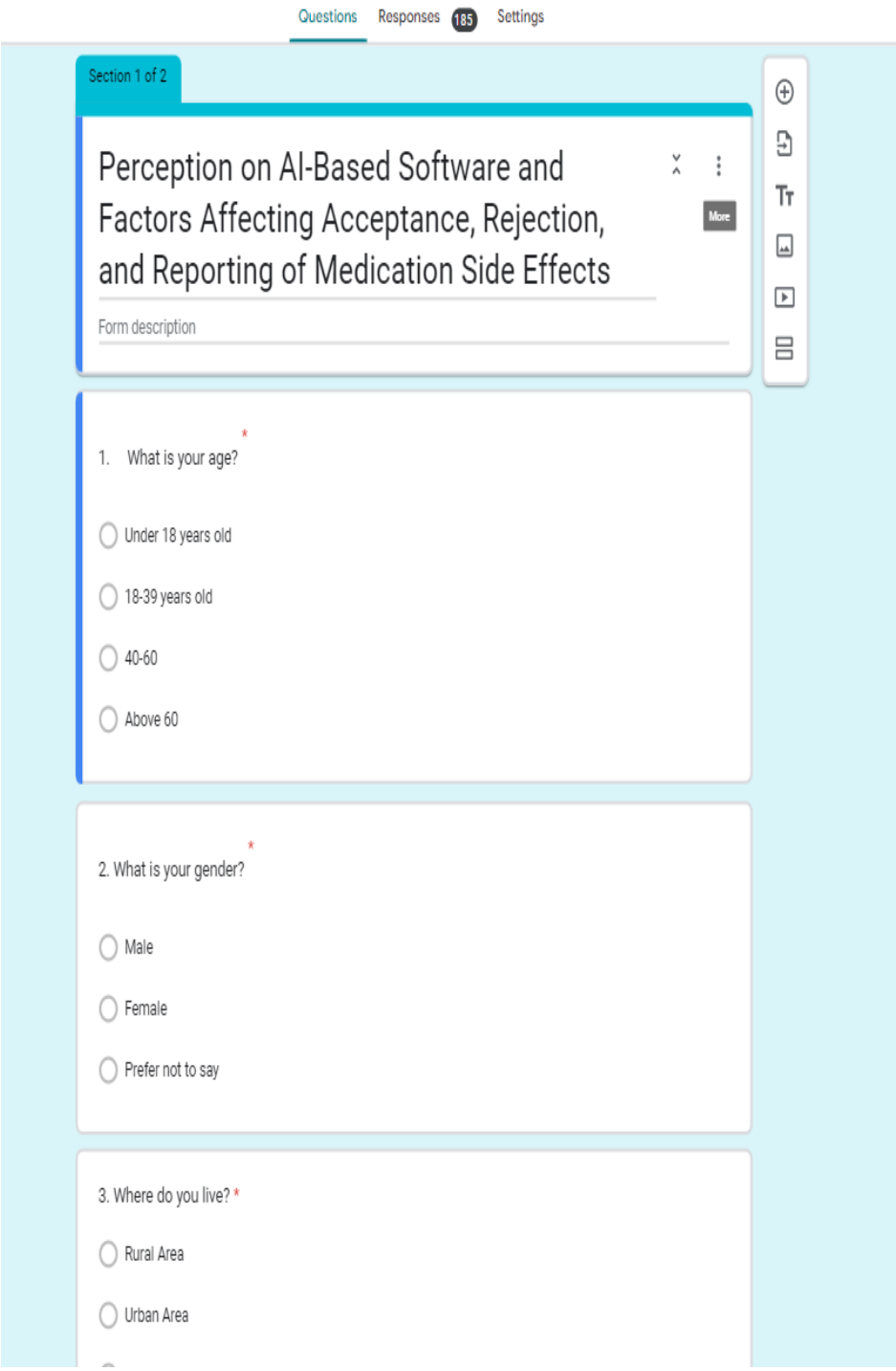
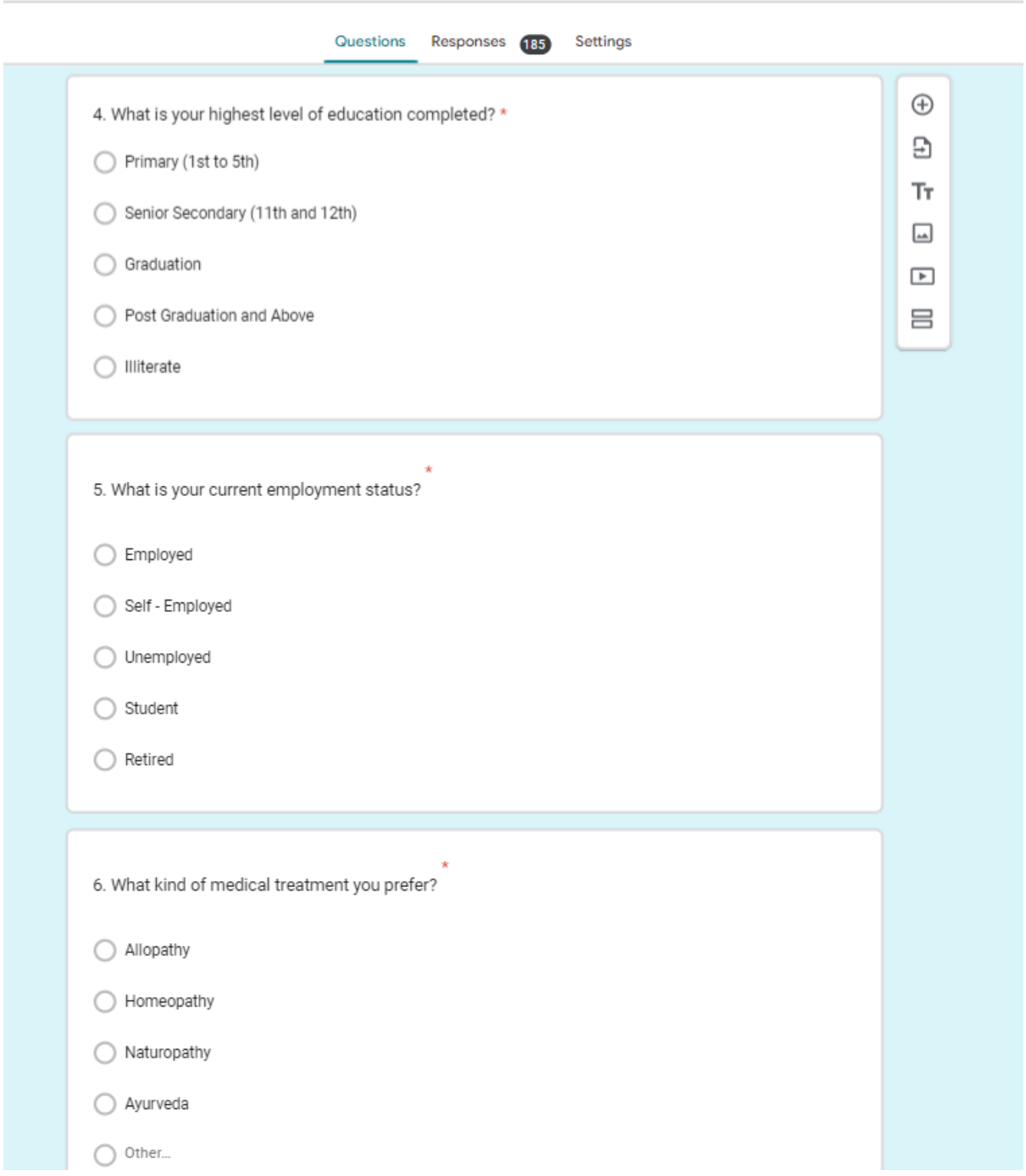
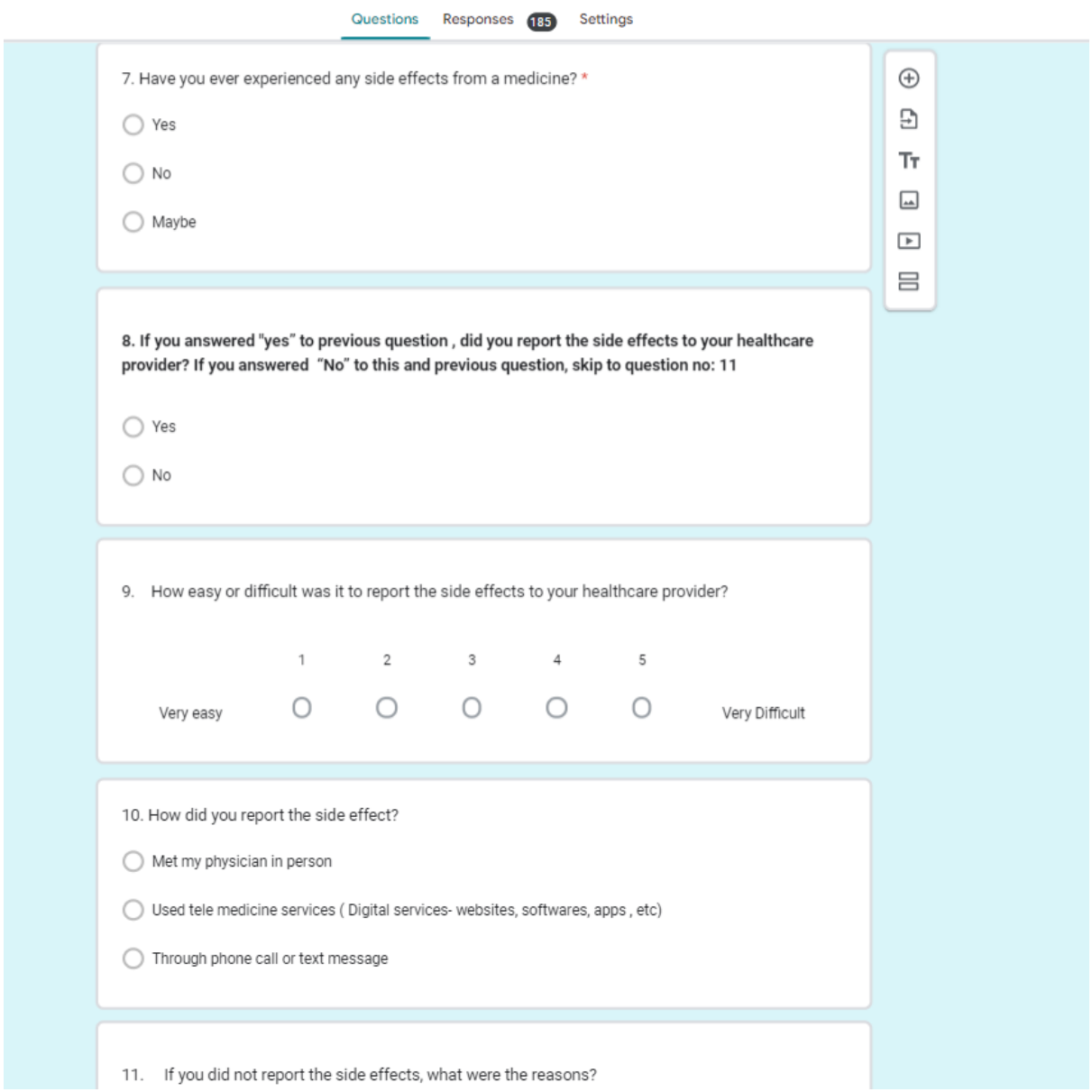
Annexure

Annexure: A


Questions
Responses 185
Settings
Section 1 of 2
Perception on AI-Based Software and Factors Affecting Acceptance, Rejection, and Reporting of Medication Side Effects
More
Form description
1. What is your age? *
Under 18 years old
18-39 years old
40-60
Above 60
2. What is your gender? *
Male
Female
Prefer not to say
3. Where do you live? *
Rural Area
Urban Area


Questions
Responses 185
Settings
4. What is your highest level of education completed? *
Primary (1st to 5th)
Senior Secondary (11th and 12th)
Graduation
Post Graduation and Above
Illiterate
5. What is your current employment status? *
Employed
Self - Employed
Unemployed
Student
Retired
6. What kind of medical treatment you prefer? *
Allopathy
Homeopathy
Naturopathy
Ayurveda
Other...


Questions
Responses 185
Settings
7. Have you ever experienced any side effects from a medicine? *
Yes
No
Maybe
8. If you answered "yes" to previous question , did you report the side effects to your healthcare provider? If you answered "No" to this and previous question, skip to question no: 11
Yes
No
9. How easy or difficult was it to report the side effects to your healthcare provider?
1
2
3
4
5
Very easy
Very Difficult
10. How did you report the side effect?
Met my physician in person
Used tele medicine services (Digital services- websites, softwares, apps , etc)
Through phone call or text message
11. If you did not report the side effects, what were the reasons?

11. If you did not report the side effects, what were the reasons?

- ○ Not Applicable
- ○ I did not know how to report the side effects
- ○ I did not think the side effects were serious enough to report
- ○ I did not want to bother my healthcare provider

12. Do you have access to a smartphone or tablet with internet access? *

- ○ Yes
- ○ No

13. What do you use smartphone for? *

- ☐ Calls
- ☐ Messages
- ☐ Social Media
- ☐ Net surfing
- ☐ Banking and Cash Transactions
- ☐ Work emails, messages, etc
- ☐ Other...

14. Do you have access to a computer/laptop with internet access? *

14. Do you have access to a computer/laptop with internet access? *

- ○ Yes
- ○ No

15. What do you use computer/ laptop for? *

- ☐ Professional Work
- ☐ Social Media
- ☐ Browsing websites
- ☐ Entertainment

16. How confident do you feel using a smartphone or / laptop/ computer? *

	1	2	3	4	5	
Not confident at all	○	○	○	○	○	Very confident

17. How comfortable do you feel navigating websites and using search engines? *

	1	2	3	4	5	
Not at all comfortable	○	○	○	○	○	Very Comfortable

18. What types of medical treatment systems (E-consults, virtual appointments, app based services) have you learned about through social media platforms? *

Short answer text

19. Do you trust the information shared on social media regarding medical treatments and other medical information? *

- Yes
- No
- Maybe

20. How frequently do you engage with discussions or forums on social media about medical treatments and other medical information? *

- Always
- Often
- Sometimes
- Rarely
- Never

21. Have you ever used telemedicine for other services, such as video appointments with healthcare providers? *

- Yes
- No

22. If you have used telemedicine services, how satisfied were you with the experience? If *

22. If you have used telemedicine services, how satisfied were you with the experience? If you haven't used the services, please select "N/A". *

- [ ] Very satisfied
- [ ] Satisfied
- [ ] Neutral
- [ ] Disatisfied
- [ ] Very dissatisfied
- [ ] N/A

23. How important do you think it is for healthcare providers to offer telemedicine services? *

1	2	3	4	5
○	○	○	○	○

24. How important do you think it is to report side effects of medicines to healthcare providers? *

- ○ Very important
- ○ Somewhat important
- ○ Neutral
- ○ Somewhat unimportant
- ○ Very unimportant

Section 2 of 2

Awareness and Perception about Artificial Intelligence

Description (optional)

1. If you did not report the side effects, would you be more likely to report them if there was an easy and convenient way to do so? *

- Yes
- No
- Maybe

2. How familiar are you with the concept of artificial intelligence? *

- Very familiar
- Somewhat familiar
- Not familiar at all

3. Do you think that artificial intelligence can help improve drug (medicine) safety? *

- Yes
- No
- Maybe

4. Would you be willing to share your personal health information (e.g. medical history, *

3. Do you think that artificial intelligence can help improve drug (medicine) safety? *

- ◯ Yes
- ◯ No
- ◯ Maybe

4. Would you be willing to share your personal health information (e.g. medical history, medication use) with an artificial intelligence system for drug safety purposes? *

- ◯ Very likely
- ◯ Likely
- ◯ Less Likely
- ◯ Not at all

5. Have you ever used artificial intelligence software before? *

- ◯ Yes
- ◯ No
- ◯ Not sure

Annexure-B

Report Ritu Raj

ORIGINALITY REPORT

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