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RESEARCH ARTICLE

A knowledge, attitude, and practices study of pharmacogenomics and its educational needs among doctors in a tertiary care hospital

Arathy R[1], Jiyo Chacko[2], Santosh Pillai[3]

[1]Department of Pharmacology, Sree Gokulam Medical College and Research Foundation, Venjaramoodu, Trivandrum, Kerala, India, [2]Department of Pharmacology, Believers Church Medical College Hospital, Thiruvalla, Kerala, India, [3]Department of Pharmacology, Pushpagiri Institute of Medical Sciences and Research Centre, Thiruvalla, Pathanamthitta, Kerala, India

Correspondence to: Jiyo Chacko, E-mail: jiyochacko@yahoo.com

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ABSTRACT

Background: Genetic differences account for a large amount of patient variation in drug response and disposition. Pharmacogenomics is the study of genetic factors that underlie variation in drug response. **Aims and Objective:** The objective of the study was to assess the knowledge, attitude, and practices of pharmacogenomics and its educational needs among doctors of a tertiary care teaching hospital in South India. **Materials and Methods:** A cross-sectional survey was conducted among 100 doctors using a structured questionnaire. **Results:** Nearly 92% of the survey participants were of the age group 25–34 years. When choosing appropriate drug therapy for patients, medical history and age were the factors most commonly cited by respondents as extremely or very important (94%) followed by adverse effects (44%), labeled indication (33%), and genetic information (26%). When asked to rank their familiarity with pharmacogenomics, 38% reported somewhat familiar with the topic. 40% strongly or somewhat agreed that they were confident in their knowledge of the influence of genetics on drug therapy. 94% of respondents found pharmacogenomic information in drug labeling extremely/very/somewhat helpful. 44% of participants knew that drug metabolizing enzymes were the most commonly recognized mechanism for pharmacogenomic differences in drug response. Only 2% of survey respondents had ordered a pharmacogenomic test last year. The most common reasons for not ordering were not knowing what test to order (46%), not applicable for their patients (38%), and uncertainty about the clinical value of the test (30%). 30% anticipated ordering a pharmacogenomic test next year. The most common pharmacogenomic resource consulted by survey participants were internet (78%), scientific literature (46%), and medical association literature (30%). The most common list of topics indicated by the respondents to be included in an ideal pharmacogenomic resource was how to interpret pharmacogenomic test results (68%), effect of genetic variation on mechanism of drug action (62%), and description of pharmacogenomic information on drug labeling (56%). The most common preferred formats for an ideal pharmacogenomic resource were indicated as web-based (58%), mobile application (58%), and print materials (32%). **Conclusion:** The use of pharmacogenomic tests is low. There is a need for improved resource material preferably in electronic format to increase the application of genomics to clinical care.

KEY WORDS: Pharmacogenomics; Knowledge; Attitude; Practices

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INTRODUCTION

Pharmacogenomics is the study of genetic factors that underlie variation in drug response.[1] Genetic make up of individuals causes pharmacokinetic and pharmacodynamic variations. Application of pharmacogenomics to clinical care can increase the efficacy and safety of drugs.

US Food and Drug Administration has introduced pharmacogenomic information in drug labeling for more than 200 drugs. With the advent of personalized medicine, the application of pharmacogenomics to clinical care is increasing. However, the formal training of doctors in pharmacogenomics is less in the medical school. Hence, it is important to assess the knowledge, attitude, and practices of pharmacogenomics and its educational needs among doctors in a tertiary care hospital.

The aim of the study was to assess the knowledge, attitude, and practices of pharmacogenomics and its educational needs among doctors in a tertiary care hospital.

MATERIALS AND METHODS

A cross-sectional survey was conducted among 100 doctors of a tertiary care hospital to have an insight into their knowledge, attitude, and practices regarding pharmacogenomics, using a structured questionnaire. The study was performed after getting approval from the Institutional Ethics Committee.

The collected data were analyzed using descriptive statistics. The data were analyzed for the following parameters - study group characteristics, knowledge of pharmacogenomics, pharmacogenomics test ordering, current and ideal pharmacogenomic source. Data entry and analysis was done using Microsoft office excel 2010.

RESULTS

Nearly 92% of the survey participants were of the age group 25–34 years. 55% of the respondents were working in medicine and allied specialties. 74% of the respondents used smartphone and laptop to access health-care-related information [Table 1].

When choosing appropriate drug therapy for patients, medical history and age were the factors most commonly cited by respondents as extremely or very important (94%) followed by adverse effects (44%), labeled indication (33%), and genetic information (26%). Genetic information was considered less important by the majority [Figure 1]. 94% of respondents found pharmacogenomic information in drug labeling extremely/very/somewhat helpful. 44% of participants knew that drug metabolizing enzymes were the most commonly recognized mechanism for pharmacogenomic differences in drug response.

Familiarity with, confidence in and knowledge of, and training in pharmacogenetics, as reported by respondents is shown in Figure 2.

Only 2% of survey respondents had ordered a pharmacogenomic test last year. 30% anticipated ordering a pharmacogenomic test next year [Figure 2]. Current pharmacogenomic resources consulted by respondents are described in Table 2. Concepts of an ideal pharmacogenomic

Table 1: Characteristics of survey population (n=100)

	Total respondents (%)
Age years	92
25–34	
35–44	7
45–54	1
Specialty	
Medicine and allied	55
Surgery and allied	22
General practitioners	23
Devices used to access health-care-related information	
Smartphone	74
Laptop	74
Desktop computer	36
Tablet computer	20

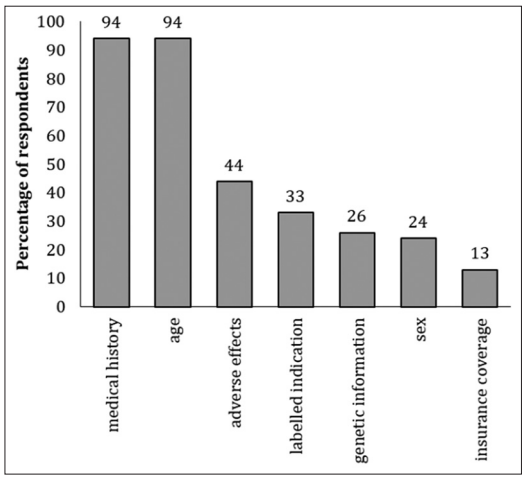

Figure 1: Factors sited as extremely/very important by respondents when choosing appropriate drug therapy

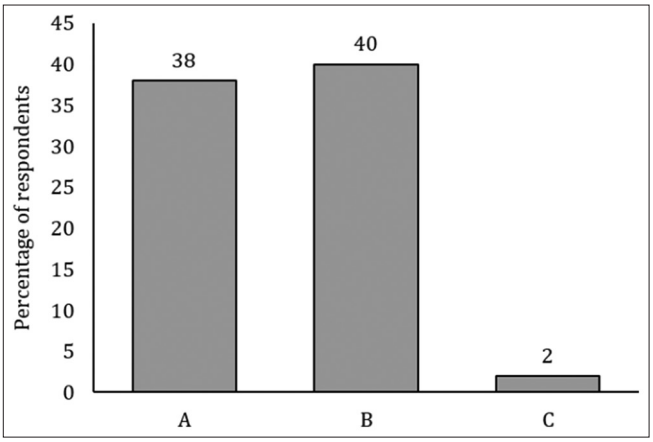

Figure 2: a: Somewhat familiar with pharmacogenomics; b: Strongly/somewhat agree that I am confident in my knowledge about the influence of genetics on drug therapy; c: Have had formal training in pharmacogenomics

Table 2: Resources currently consulted when questions arise about pharmacogenomics

Resources	Total respondents (*n*)
Internet (e.g.:Google searches)	78
Scientific literature	46
Medical association literature/guidelines/ recommendations	30
Peer discussion	22
Drug labeling	10
FDA website	8
Others	12
Do currently available resources enable you to access the pharmacogenomic information you need or want to know?	
Yes	94
No	6

resource are described in Table 3. Reasons most commonly cited by physician respondents for not ordering a pharmacogenomic test in the past year, and for not anticipating ordering a pharmacogenomic test in the next year are shown in Figure 3.

DISCUSSION

The results of our study like other studies suggest a lack of familiarity in pharmacogenomic knowledge and practices among respondents. Although about 40% of respondents considered themselves to be familiar and confident in their knowledge of pharmacogenomics, genetic information was considered important by only a minority (26%) while prescribing.

Nearly 94% of respondents found pharmacogenomic information in drug labeling extremely/very/somewhat helpful. 84% of the clinicians and 8% of the postgraduates agreed or strongly agreed that they are aware of labeling regulation of pharmacogenomics in drug packages.[2] Less than half of the respondents (44%) were aware of the basic fact that enzymes were the most common mechanism for pharmacogenomic drug responses. Majority of respondents (98%) had not ordered even a single pharmacogenomic test during last year citing the reason that they were not knowing what test to be ordered. These lack of knowledge was mainly due to a lack of formal training. Only 2% had undergone formal training as part of Continuing Medical Education programs. A study done by Kudzi *et al*.[3] in Ghana revealed that 97.6% of the doctors were of the opinion that pharmacogenomics should be included in their continuing professional education training. A survey done on US physicians by Stanek *et al*.[4] revealed that most of the physicians were not well informed on the clinical utility of tests. This study found that only

Table 3: Preferred characteristics for an ideal pharmacogenomic resource

Characteristics	Total respondents (*n*=100)
Content	
How to interpret pharmacogenomic test results	68
Effect of genetic variation on the mechanism of drug action	62
Description of pharmacogenomic information in drug labeling	56
Recommendations for prescribing	46
List of laboratories offering testing	36
References (such as scientific literature)	24
Demographics of populations likely to carry variations	22
Format of ideal resource	
Web-based	58
Mobile application (for smartphone or tablet)	58
Pop-up reminders within prescribing system	34
Print materials	32
Incorporated within EMR	12

EMR: Electronic medical record

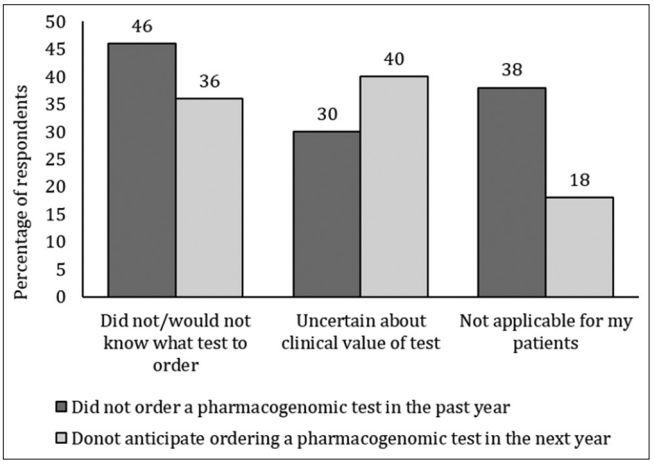

Figure 3: Reasons most commonly cited by physician respondents for not ordering a pharmacogenomic test in the past year, and for not anticipating ordering a pharmacogenomic test in the next year

15% had received information on pharmacogenomics during their graduate training. Haga *et al*.[5] found that the important concerns for not ordering genomic risk profiling by primary care physicians in the US were uncertain clinical utility, the risk of disability, the potential for discrimination, confidentiality, and cost.

Like other studies, we found that the respondents are not completely satisfied with current genomic education resources. A resource in electronic format which includes components such as interpretation of pharmacogenomic test, the effect of genetics on drug action, and description of same in drug label was considered to be an ideal one. Johansen Taber *et al*.[6] did a survey in the US which revealed that more

than 75% of respondents used smartphone or computer to access health-care-related information.

Haque *et al*.[7] did a systematic review of knowledge, attitude, and practice toward pharmacogenomics among doctors. 14 out of 15 systematic reviews revealed limited knowledge as a barrier to adopt pharmacogenomics into practice.

Study Limitations

Our study had a small sample size. There was an overrepresentation of the physicians belonging to the younger age group.

CONCLUSION

The use of the pharmacogenomic test is low. There is a need for improved resource material preferably in electronic format to increase the application of genomics to clinical care. There is a lack of formal training in this subject, and it has to be given more emphasis in the undergraduate medical curriculum. More Continuing Medical Education programs have to be conducted on pharmacogenomics.

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