

## STUDY OF AWARENESS AMONG HEALTHCARE PROVIDERS FOR THE NEED TO PERIODICALLY SCREEN RENAL FUNCTIONS IN DIABETIC PATIENTS RECEIVING METFORMIN

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### ABSTRACT

**Objectives:** To evaluate the awareness of serum creatinine monitoring and maximum daily dose of metformin among healthcare providers.

**Methods:** We conducted the prospective-observational study among healthcare providers like attending physicians, resident doctors, medical students and nurses. A questionnaire with multiple choice questions was designed and circulated among various healthcare providers in a tertiary care hospital in Hoskote, Bangalore, Karnataka. The participants were unaware of the study objective.

**Results:** Total of 100 Healthcare Providers participated in our survey. The majority of them were faculty members (attending physicians or HODs; n= 33) or resident doctors (n=50) contributed towards 83% of the participants while students (n= 7) and nurses (n= 10) were the minority participants at the hospital. Awareness of serum creatinine monitoring in patients receiving metformin in the Attending Physicians (84%) seem to be higher as compared to the Resident Doctors (72%). Medical students (14%) and nurses (30%) had a very low awareness. Awareness of maximum daily dose for metformin in the Attending Physicians (78%) seem to be higher as compared to the Resident Doctors (64%). Medical students (14%) and nurses (30%) had a very low awareness.

**Conclusion:** Awareness of maximum daily dose of metformin and serum creatinine monitoring was high among physicians as compared to resident doctors. Nurses and medical students lacked in this knowledge. Clinical pharmacist can play a vital role by providing concise information about new drug therapies, warnings and precautions about old/new drugs to health care providers. Working together, clinical pharmacists and physicians can improve the patient care.

**Keywords:** Diabetes, Metformin, Renal function, Lacticacidosis, Attending physicians, Resident doctor, Medical student, Nurse.

### INTRODUCTION

Diabetes is the single most important metabolic disease which can affect nearly every organ system in the body. Metformin has been a hallmark of antidiabetic therapy for several years. There are several possible metformin benefits, such as decreasing hemoglobin A1c levels, lowering total cholesterol, and increasing fertility in women with polycystic ovarian syndrome [1]. With metformin therapy, insulin secretion remains unchanged while fasting insulin levels and day-long plasma insulin response may actually decrease [2]. Metformin is known to be substantially excreted by the kidneys. Renal clearance of metformin is approximately 3.5 times greater than creatinine clearance, which indicates that tubular secretion is the major route for its elimination [3]. Following oral administration, approximately 90% of the absorbed drug is eliminated via the renal route within the first 24 hours, with a plasma elimination half-life of approximately 6.2 hours [4]. The risk of metformin accumulation and lactic acidosis increases with the degree of impairment of renal function [5]. The reported incidence of lactic acidosis in patients receiving metformin hydrochloride is very low (approximately 0.03 cases/1000 patient-years, with approximately 0.015 fatal cases/1000 patient years) [6]. The risk of lactic acidosis may therefore, be significantly decreased by regular monitoring of renal function in patients taking metformin and by use of the minimum effective dose of metformin [7]. In particular, treatment of the elderly should be accompanied by careful monitoring of renal function. Patients should be cautioned against excessive alcohol intake, either acute or chronic, when taking metformin, since alcohol potentiates the effects of metformin hydrochloride on lactate metabolism [6]. Although, monitoring of serum creatinine levels for optimal utilization of metformin has been established, evidence for monitoring methods is not documented in the scientific literature. The first step in routine monitoring of serum creatinine levels would be the basic awareness and knowledge of importance of this test among healthcare providers. Knowledge of current guidelines for metformin utilization in renally impaired patients would be the key to success for

metformin therapy. The present study is undertaken to evaluate the awareness and knowledge of various healthcare providers for routine serum creatinine evaluation in patients receiving metformin.

Metformin hydrochloride extended-release tablets may be used concomitantly with a sulfonylurea or insulin to improve glycemic control in adults (17 years of age and older) [7].

The maximum recommended daily dose of metformin hydrochloride extended-release in adults is 2000 mg.<sup>(7)</sup>Metformin should be started at a low dose, with gradual dose escalation, both to reduce gastrointestinal side effects and to permit identification of the minimum dose required for adequate glycemic control of the patient [7].

Current guidelines recommend dosage adjustment with metformin in patients with renal insufficiency. In males if serum creatinine above 1.5 mg/dl and in females serum creatinine above 1.4 mg/dl warrant dosage adjustment [8].

### Objectives

- To evaluate the awareness of serum creatinine monitoring in patients receiving metformin among healthcare providers like attending physicians, resident doctors, medical students and nurses.
- To evaluate the awareness of the maximum daily dose of metformin among healthcare providers like attending physicians, resident doctors, medical students and nurses.
- To evaluate the awareness of serum creatinine monitoring with regards to current prescribing guidelines in patients receiving metformin among healthcare providers like Attending physicians, resident doctors, medical students and nurses.

### MATERIALS AND METHODS

#### Study period

Seven Months from January-2013 to July 2013

**Study design**

Prospective-observational study

**Sample size**

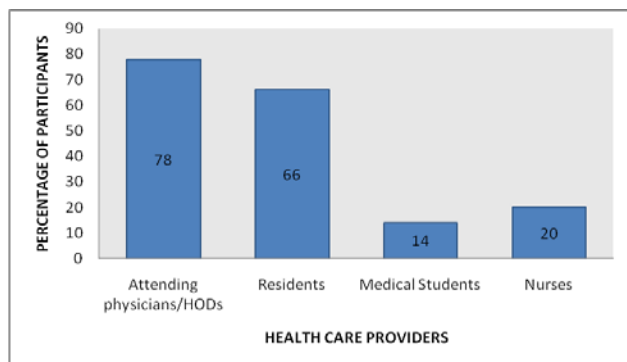
100 Healthcare Providers

To evaluate the awareness of serum creatinine monitoring among healthcare providers a questionnaire with multiple choice questions was designed. This questionnaire was circulated among various healthcare providers in a tertiary care hospital in Hoskote, Bangalore, Karnataka. The participants were unaware of the study objective. During the interaction with the healthcare providers, the objective of the study was disclosed as "A study on diabetes". The questions were designed in such a way that the objective of the study was not obvious to the participants. Each question was designed to get either specific information regarding the objective of the study or to obfuscate the participant about the actual objective of the study.

**RESULTS**

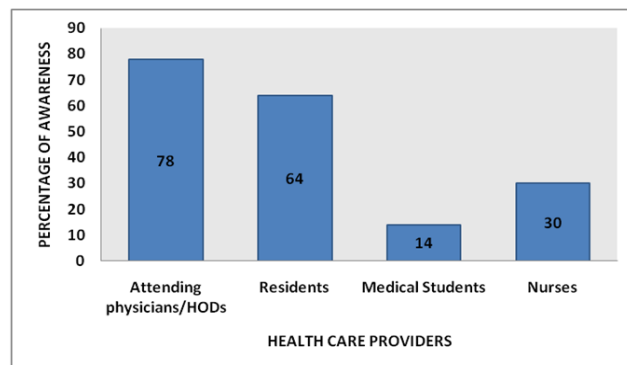
**Participant demographics**

The survey was conducted over a period of two months in a tertiary care hospital in Hoskote. The participant demographics are represented in Graph I. Majority of the participants were faculty members (attending physicians or HODs; n= 33) or resident doctors (n=50) at the hospital. Participation from nurses and medical students was lesser than that of physicians.



**Graph 1: Participant demographic distribution**

The participant distribution is reported as actual number of total participation (n=100). The Attending Physicians (n=33) and Resident Doctors (n=50) contributed towards 83% of the survey while students (n= 7) and nurses (n= 10) were the minority participants.



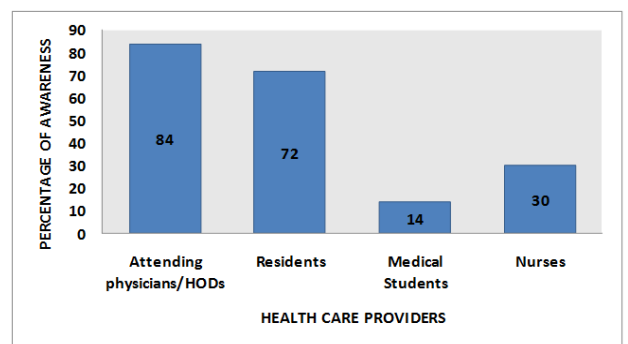
**Graph II: Percentage awareness of metformin maximum daily dose**

Awareness is expressed as the percentage in each group. The Attending Physicians (n=26 out of 33 participants) seem to have a higher awareness as compared to the Resident Doctors (n=32 out of 50 participants). Medical students (n=1 out of 7 participants) and nurses (n= 3 out of 10 participants) had a very low awareness of metformin.

nurses (n=3 out of 10 participants) had a very low awareness of the maximum daily dose for metformin.

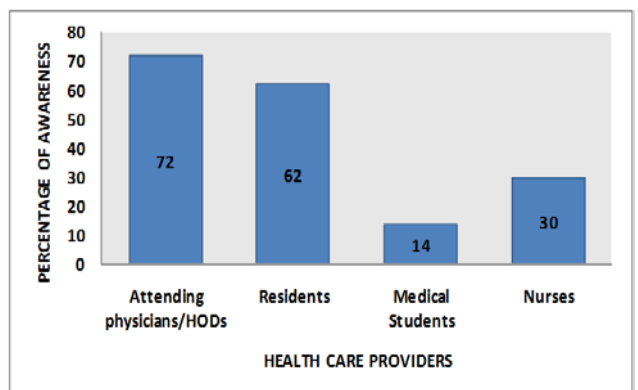
**True percent awareness of serum creatinine monitoring in patients receiving metformin**

Serum Creatinine monitoring awareness was measured by evaluating question number 1 and 3 in the questionnaire. These questions were designed to differentiate between true awareness and picking the correct answer in multiple choice questions by chance or guess work. Question number 1 asked which one of the different laboratory parameters should be monitored before prescribing metformin, the correct answer is serum creatinine whereas question number 3 asked that in which the patient population, metformin should be prescribed with caution, the correct answer is renal dysfunction. Health care providers who answered both questions and picked serum creatinine monitoring and renal dysfunction in both answers were assumed to have true awareness while health care providers who only picked serum creatinine or renal dysfunction as a determinant in only one question were assumed to have picked the answer by chance alone. This data is represented in table I.



**Graph III: Total percent awareness of serum creatinine monitoring in patients receiving metformin**

Awareness is expressed as percentage in each group. The Attending Physicians (n=28 out of 33 participants) seem to have a higher awareness as compared to the Resident Doctors (n=36 out of 50 participants). Medical students (n=1 out of 7 participants) and nurses (n=3 out of 10 participants) had a very low awareness of serum creatinine monitoring in patients receiving metformin.

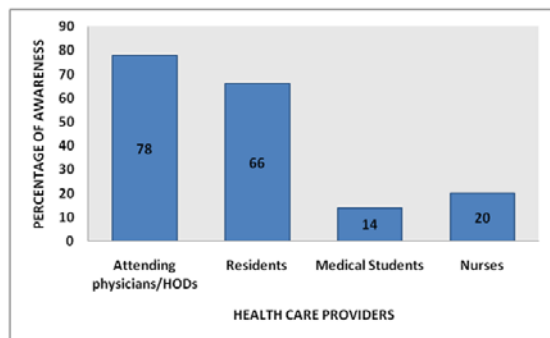


**Graph IV: True percent awareness of serum creatinine monitoring in patients receiving metformin**

The Attending Physicians (n= 24 out of 33 participants) seem to have a higher true awareness as compared to the Resident Doctors (n=31 out of 50 participants). Medical students (n=1 out of 7 participants) and nurses (n= 3 out of 10 participants) had a very low true awareness of serum creatinine monitoring in patients receiving metformin.

**Table I: Awareness of serum creatinine monitoring among health care providers: Distinguishing between chance and true awareness**

Type of HCP	True awareness		Awareness by chance	
	Number	Percentage	Number	Percentage
Attending Physicians/HOD (n=33)	24	72.7	4	12.12
Resident Doctors (n=50)	31	62	5	10
Nurses (n=10)	3	30	0	0
Medical Students (n=7)	1	14.28	0	0

**Graph V: Percentage awareness of current guidelines while prescribing metformin**

The Attending Physicians (n=26 out of 33 participants) seem to have a higher awareness as compared to the Resident Doctors (n=33 out of 50 participants). Medical students (n=1 out of 7 participants) and nurses (n=2 out of 10 participants) had a very low awareness of serum creatinine monitoring current guidelines in patients receiving metformin.

## DISCUSSION

The present study evaluated the awareness and knowledge of various healthcare providers for routine serum creatinine evaluation in patients receiving metformin. The participants in the present study were mainly attending physicians and resident doctors. This probable is due to the fact that most students are busy with course work and are generally averse to the idea of any survey or test that evaluates their knowledge. The limited participation by nurses can be explained by the fact that most of the nurses have many time-consuming tasks like patient data entry in addition to the actual patient care. Further, participation in a survey always poses a risk of evaluation of knowledge and hence the natural fear of participation.

Electronic patient history and electronic prescriptions are commonly used in the developed countries. Most of these programs have in-built safeguards for maximum daily dose, warnings and precaution. These safeguards help healthcare providers provide optimal therapy with many drugs and help minimize adverse drug reactions in patients. In India such electronic devices are used rarely and optimal care depends a lot on the knowledge and expertise of the healthcare provider. In the present study, we observed that the knowledge about serum creatinine/renal function monitoring in patients receiving metformin was high among attending physicians. Although, this awareness was lesser in resident doctors, this could be due to the area of expertise. Medical students and nurses exhibited much less awareness than physicians. This might be the area where clinical pharmacist could play a vital role. While physicians are the masters of diagnosis, clinical pharmacists are the experts of drug therapy. Clinical pharmacist could play a role as an associate for the physicians and conduct continuing education (CE) programs. Such CE programs could help our overworked healthcare providers to gain maximum updates on drug therapy such as the maximum daily dose or current recommendations or guidelines in the shortest possible time. Such drug updates can be delivered in many forms. Some such suggestions are a SEMINAR ON newly approved drugs, new guidelines on old drugs, or newly recommended warnings or precautions, updates on current recommendation on therapy of common diseases and disorders such as diabetes and hypertension, major clinical trials, new breakthrough

research on drugs, diseases or disorders, infectious diseases and immunization, Common medication errors, provide printed education material on all of the above, electronic update via email or SMS message regarding updates.

Clinical Pharmacists and healthcare providers work very closely in western countries to achieve the best patient care and to minimize ADRs. Metformin has been the hallmark of diabetes therapy for a long time and still the awareness about renal function monitoring is not very high among all types of HCPs. Clinical pharmacist working closely with physicians can play a vital role in improving patient care in India.

## CONCLUSION

Attending Physicians and resident doctors were the major participants in our survey. Participation by medical students and nurses was minimal.

Awareness of the maximum daily dose of metformin was high among physicians as compared to resident doctors. Nurses and medical students lacked in this knowledge.

Awareness of serum creatinine monitoring and current guidelines about prescribing metformin in renally impaired patients was high among physicians as compared to resident doctors. Nurses and medical students lacked in this knowledge. Clinical pharmacist can play a vital role by providing concise information about new drug therapies, warnings and precautions about old/new drugs to HCPs. Working together, clinical pharmacists and physicians can improve the patient care.

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## CONFLICT OF INTERESTS

Declared None

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