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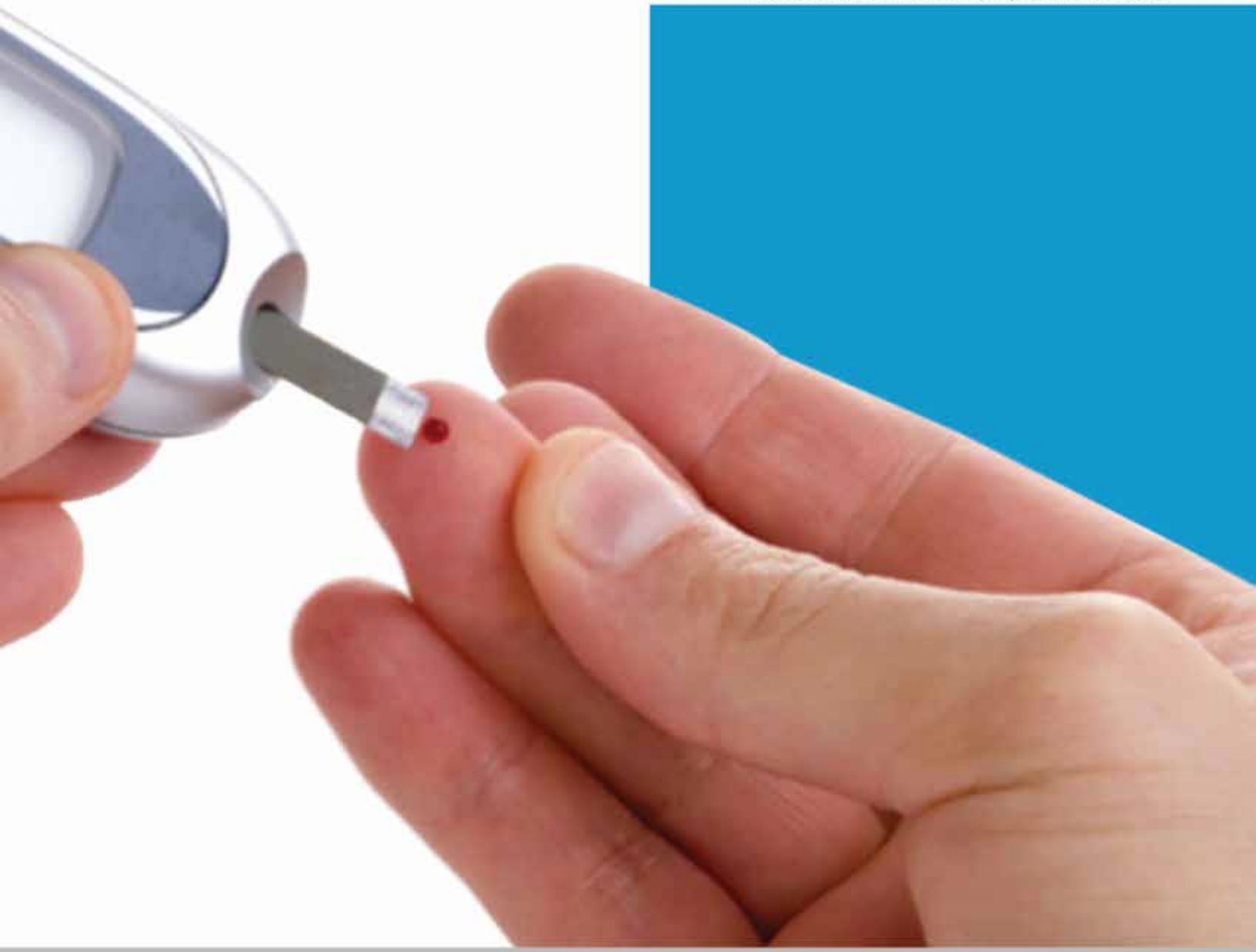

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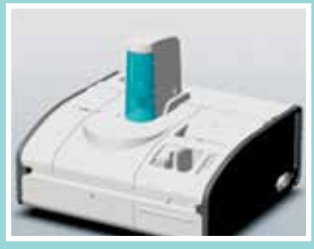

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FROM THE DESK OF THE GROUP EDITOR-IN-CHIEF

REVIEW ARTICLE

CLINICAL STUDY

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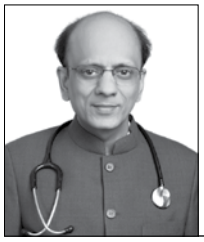

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Reinfection Rates in Patients who had Previously Tested Positive for COVID

- A retrospective cohort study was recently published in the journal *Clinical Infectious Diseases* which suggested that previous infection with COVID-19 protects against reinfection and symptomatic disease.
- The study of one multi-hospital health system included 150,325 patients who were tested for COVID-19 through PCR between March 12 and August 30, 2020. Testing performed up to February 24, 2021 in these patients was included for evaluation. The main outcome measure included reinfection (infection ≥90 days after initial testing). Secondary outcomes included symptomatic infection and protection of prior infection against reinfection.
- Among the recruited patients, 5.9% tested positive and 94.1% tested negative before August 30. Around 14.4% of the positive patients were retested 90 days later, and 62 appeared to have possible reinfection. Thirty one of these (50%) were symptomatic. Of the participants with an initial negative testing, 5,449 (3.9%) were subsequently found to be positive; 3,191 of these (58.5%) were symptomatic. Protection offered from prior infection was 81.8%, and against symptomatic infection was 84.5%. The protection was found to increase over time.
- Prior infection in patients with COVID-19 was thus reported to be highly protective against reinfection and symptomatic disease.
- The protection increased over time. The findings suggest that viral shedding or ongoing immune response may persist after 90 days and may not indicate true reinfection.
- Considering limited vaccine supply, patients with history of COVID-19 could delay early vaccination in order to enable the most vulnerable to have access to the vaccines and decrease transmission.

(Clin Infect Dis. 2021 Mar 15)

■■■■

REVIEW ARTICLE

Ambulatory Blood Pressure Monitoring

KAMAL KUMAR*, SHIVANJALI KUMAR†, RANJANA KUMAR*

ABSTRACT

Hypertension is a major health care concern. With office and home blood pressure monitoring giving insufficient information, ambulatory blood pressure monitoring has emerged as the investigation of choice for hypertension.

Keywords: Ambulatory blood pressure monitoring, white coat hypertension, morning surge, masked hypertension

The specter of hypertension looms large over the world as a leading cause of morbidity and mortality. Almost 1 billion adults representing about a quarter of the world's population had hypertension in 2000. We are likely to see this number go up to 1.56 billion by the year 2025—an increment of almost 60%. In India, the prevalence of hypertension has increased from 2% to 25% among urban residents and from 2% to 15% among the rural residents in the last 60 years.[1] Small reductions in mean systolic blood pressure (SBP) are known to significantly reduce mortality from stroke and ischemic heart disease.[2]

Office blood pressure (BP) recordings are like a single snap-shot in time and give only limited information. They have a low reproducibility as office readings taken by different personnel and/or on different instruments may differ. With office recordings, we cannot assess variations in BP at different times and in different situations, effect of stress, exercise or sleep. They may, therefore at times, not be truly representative of the BP of the patient.

Out-of-office BP measurements, therefore become necessary and these may be obtained by:

- Home blood pressure monitoring (HBPM) where the patient or his attendants measure the BP at home at specified intervals.
- Ambulatory blood pressure monitoring (ABPM) using an automatic computer-based programable BP monitoring system.

The superiority of ABPM over HBPM is well-established. ABPM provides a good estimate of the 'true' or 'mean BP' level, a record of the 'diurnal variation' of BP and of BP variability.[3]

INDICATIONS OF ABPM

Several recent guidelines now recommend ABPM as the investigation of choice in the following conditions:[4-7]

- Identification of white coat hypertension
- Identification of masked hypertension
- Identification of abnormal 24-hour BP trends:
  - Increased BP variability
  - Daytime hypertension
  - Night-time hypertension
    - Dipping patterns
    - Morning surges
    - Obstructive sleep apnea and BP
- Assessment of treatment
- Assessment of BP trends in the elderly, in young patients, in high-risk patients and in pregnancy.
- Identification of resistant hypertension, endocrine hypertension and hypertension in Parkinsonism.

AMBULATORY BLOOD PRESSURE RECORDING

ABPM was developed about four decades ago but never gained popularity due to cumbersome equipment and lack of proper standardization. Modern equipment is light-weight and portable. It consists of a cuff, a small monitor typically weighing <1 pound that is attached to a belt, and a tube connecting the cuff and monitor

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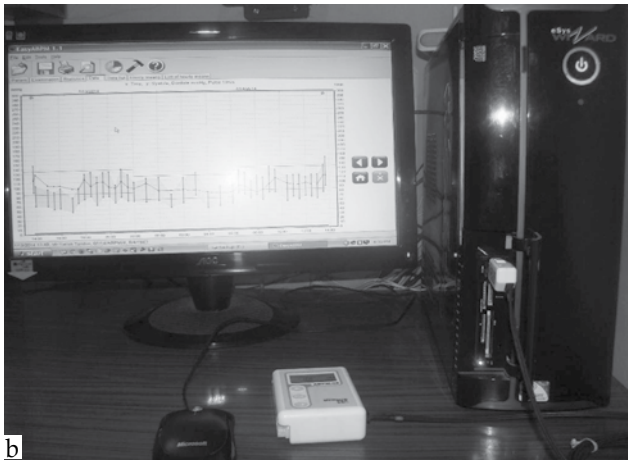
(Fig. 1 a and b). The monitor automatically records BPs every 30 minutes during waking hours and every 60 minutes during rest. These timings are programable. The monitors use the 'oscillometric technique', (i.e., they assess oscillations caused by arterial pulse pressure). Data recorded by the monitor is analyzed by device-specific software.

Limits for normal SBP and diastolic blood pressure (DBP) during daytime waking hours and night-time sleeping periods can be programed separately. Most of the currently available ABPM devices are independently validated according to the European Society of Hypertension International Protocol.[8]

a



b

Figure 1 a and b. Modern light-weight and portable ABPM device.

ABPM TERMINOLOGY

Percentage Successful

The machine should record at least 2 readings per hour during waking hours from 6.00 am to 10.00 pm and at least 1 reading per hour from 10.00 pm to 6.00 am. At least 80% of the recordings should be successful for a good record.

Mean Blood Pressure (Mean)

Is the average SBP and DBP over a 24-hour period. It includes both the active (awake) and the passive (sleep) periods. Normal value is 130/80 mmHg.

Percent Time Elevation

The percent time elevation (PTE) also called 'pressure load' is calculated individually for the entire 24-hour period, the active period and the passive period. It is the percentage of time during which the SBP, DBP or both are above limits of normal. A PTE above 25% indicates hypertension.

Hyperbaric Impact/Index

The hyperbaric impact/index (HBI) is a quantitative measure of high BP. It indicates the time and magnitude of BP excess above the upper limit of the tolerance level in a given period of time. Expressed in mmHg × hour, an HBI of >15 mmHg × hour would indicate suspected hypertension and an HBI of >50 mmHg × hour would indicate hypertension. It would also help in evaluating the response to medication.[9]

Diurnal Index

The diurnal index (DI) is the difference in mean BP between awake and sleeping BP calculated as a percentage.

- DI = [1 – (night mean SBP/awake mean SBP)] × 100
- Dipping patterns based on the DI are described later.

Morning Surge[10]

This is the percentage difference between mean SBP during the first 2 hours of waking-up and the lowest level recorded at night.

Double Product

It is also known as rate pressure product (RPP) is a marker of cardiac load. It gives a direct indication of

the energy requirements of the heart and is a good measure of energy consumption.

Double product (RPP) = Heart rate (HR) × SBP

Based on RPP the hemodynamic response can be classified as:

- High: >30,000
- High intermediate: 25,000-29,999
- Intermediate: 20,000-24,999
- Low intermediate: 15,000-19,999
- Low: <14,999

Mean Arterial Pressure

Mean arterial pressure = DBP + [(SBP-DBP)/3]

Normal range is 70-110 mmHg.

Pulse Pressure

Pulse pressure = SBP-DBP

Normal range is 40-50 mmHg.

ILLUSTRATIVE ABPM RECORDINGS

White Coat Hypertension

White coat hypertension is a condition, where the subject demonstrates raised SBP and DBP in the doctor's office or in other stressfull situations but has normal BP recordings measured at home or elsewhere. The readings measured by a doctor are usually higher than those measured by a nurse.

The patient often has tachycardia and usually does not exhibit evidence of any target organ damage. This condition is more common in women, in the elderly and those with high levels of anxiety.

White coat hypertension may be seen in 20-30% of subjects. It is no longer considered to be innocuous. Recent evidence suggests that subjects with white coat hypertension have more than double the risk of developing hypertension, have increased risk of developing diabetes and increased left ventricular mass over time (Fig. 2).[5,11,12]

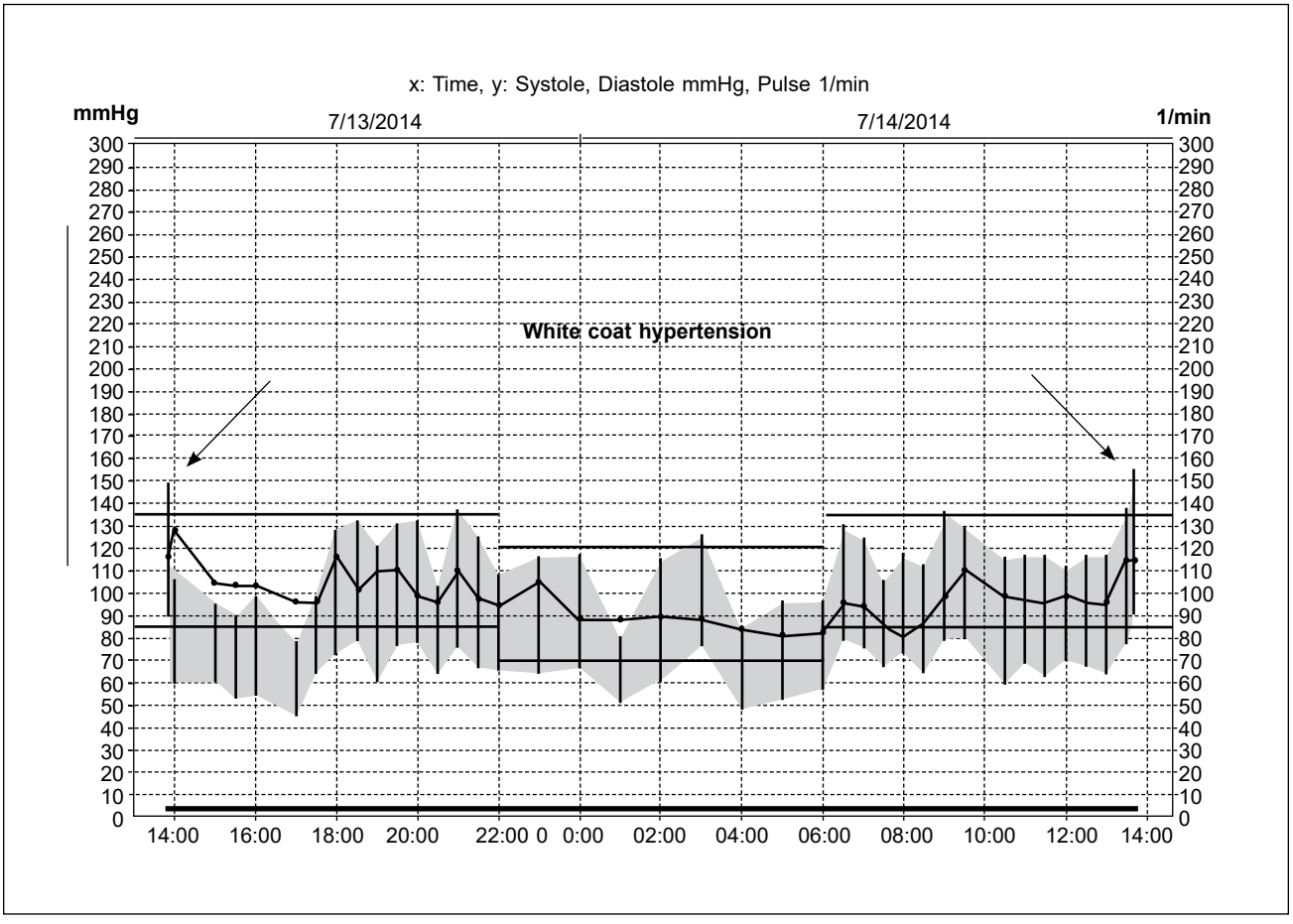


Figure 2. White coat hypertension.

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Nocturnal Dipping Patterns

Based on DI nocturnal dipping patterns are described as:[5,6]

- **Normal dipping:** The DI is between 10% and 20% (Fig. 3)
- **Nondipper:** The DI is between 0% and 10% (Fig. 4)
- **Extreme dipper:** The DI is >20% (Fig. 5)
- **Reverse dipper:** The DI is <0% (Fig. 6).

Nondipping may be seen in as much as 39% of the population with a much greater prevalence reaching 78% in diabetics. It correlates with cardiovascular (CV) autonomic neuropathy in diabetics. Nondippers, patients with exaggerated nocturnal BP fall (extreme-dippers) and those with increased nocturnal BP (reverse dippers), all have greater hypertensive target organ damage, CV events and stroke.

Abnormal dipping patterns are also a risk for left ventricular hypertrophy, silent cerebrovascular disease, microalbuminuria and progression of renal damage.[13]

Morning Surge

More than 20% difference between the average SBP of the first 2 hours after awakening and the lowest SBP recorded during the night is taken as an abnormal morning surge (Fig. 7).[10]

Shearing mechanical stress, inflammatory cascades and endothelial dysfunction associated with morning surge are responsible for the increase in CV and cerebrovascular events caused by it. Morning surge also causes increase in left ventricular mass index, increased carotid intima-media thickness and development of microalbuminuria.[11,13]

Masked Hypertension

Masked hypertension or pseudo-normotension is the reverse of white coat hypertension. The patient has normal BP recordings in the doctor's office but on ABPM is found to be hypertensive. It has a prevalence of 10-20%. These patients have similar CV risk and complications as hypertensives.[8,11]

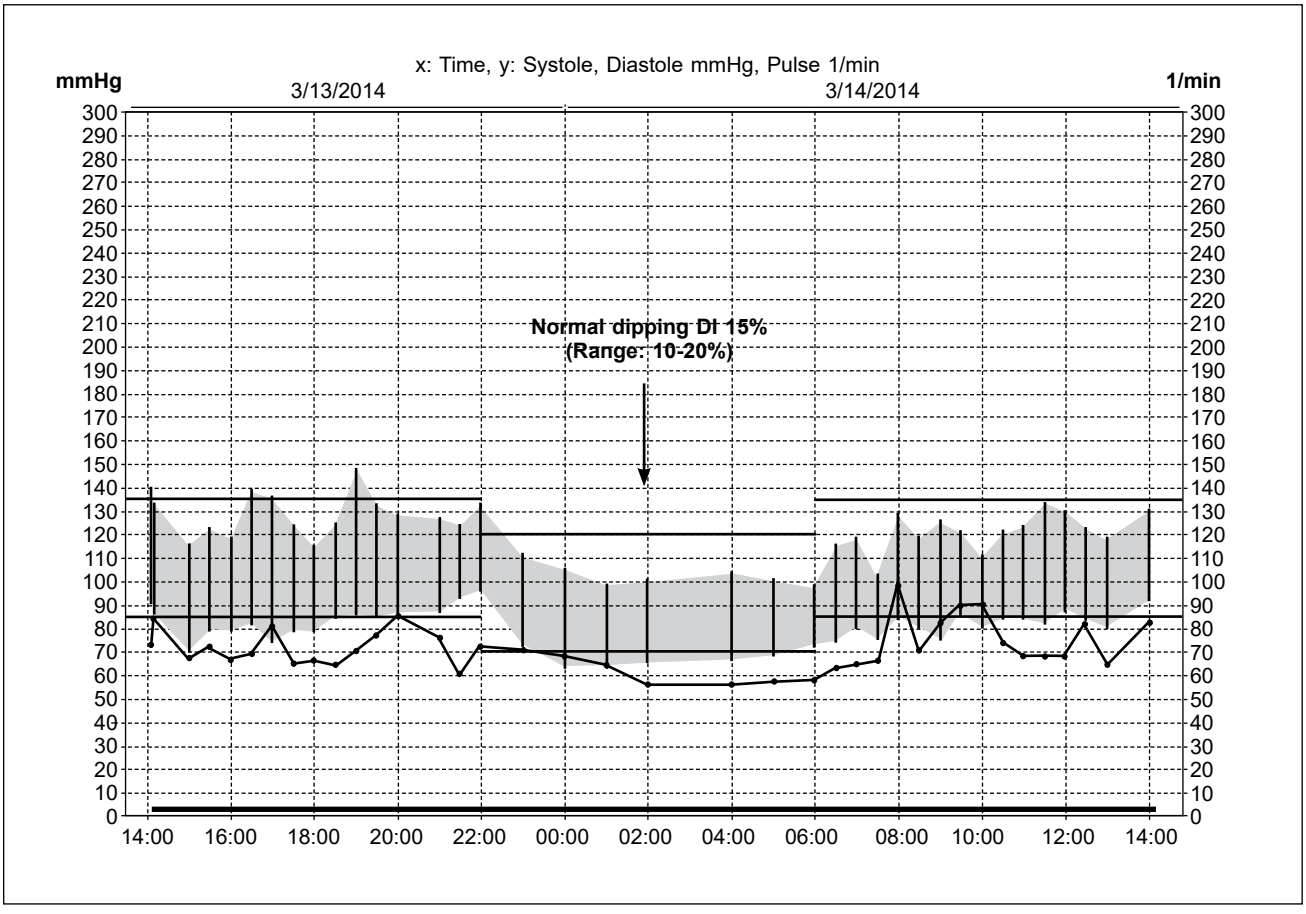

Figure 3. Normal dipping.

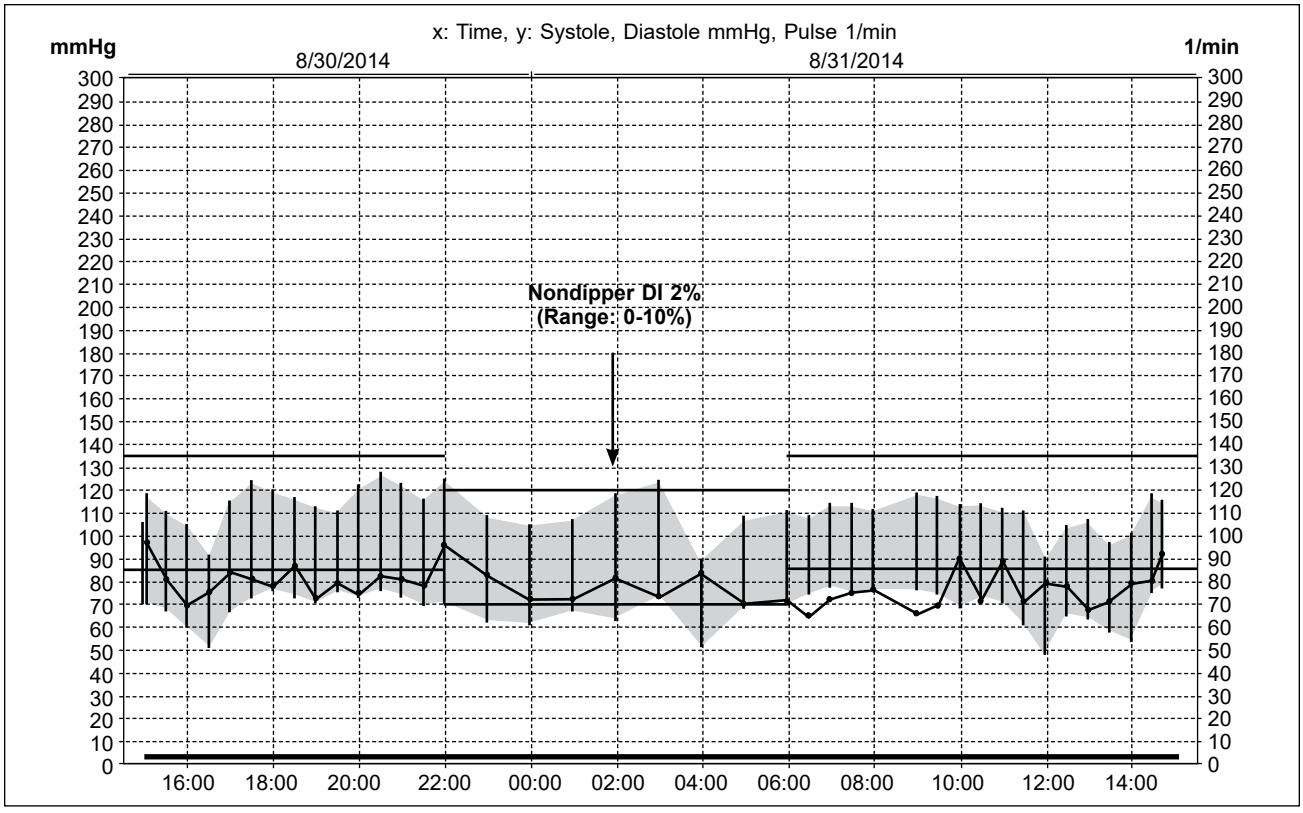

Figure 4. Nondipper.

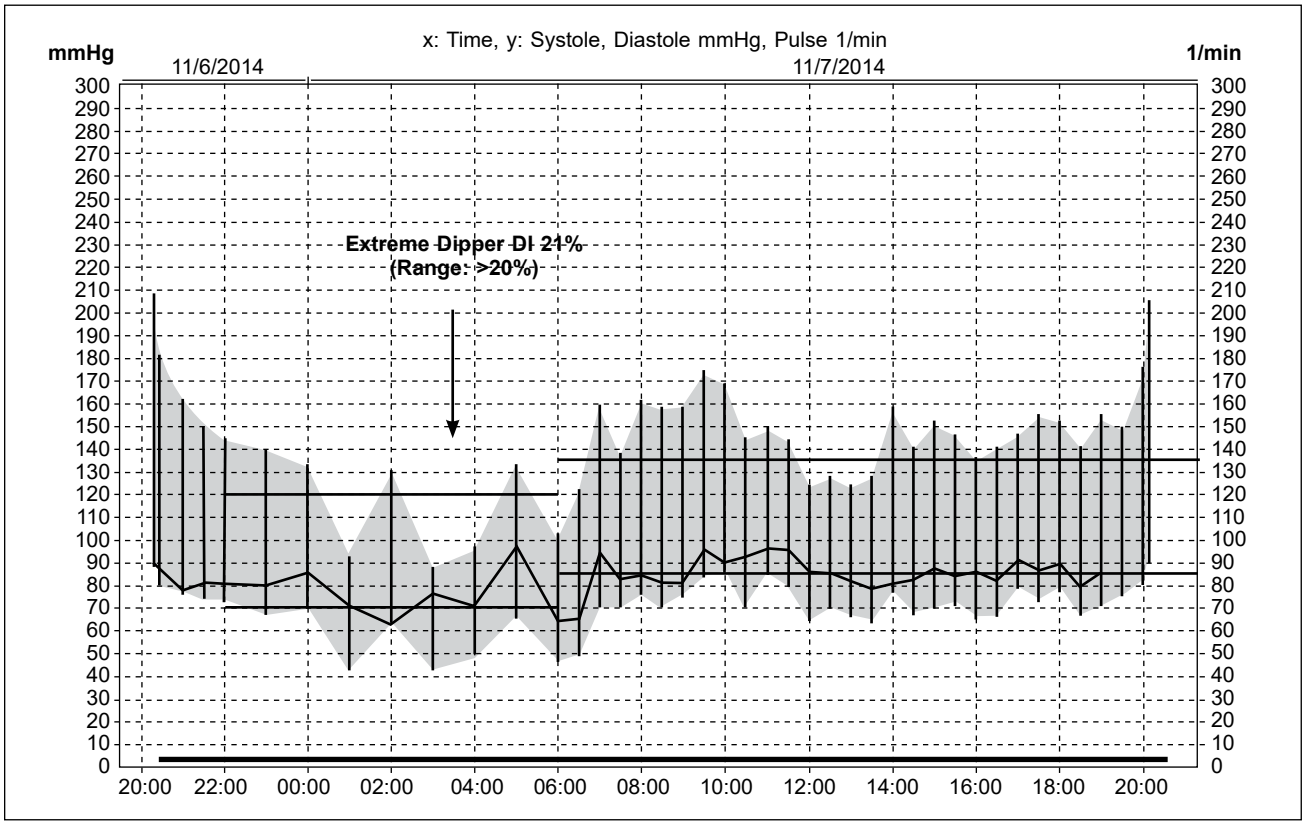

Figure 5. Extreme dipper.

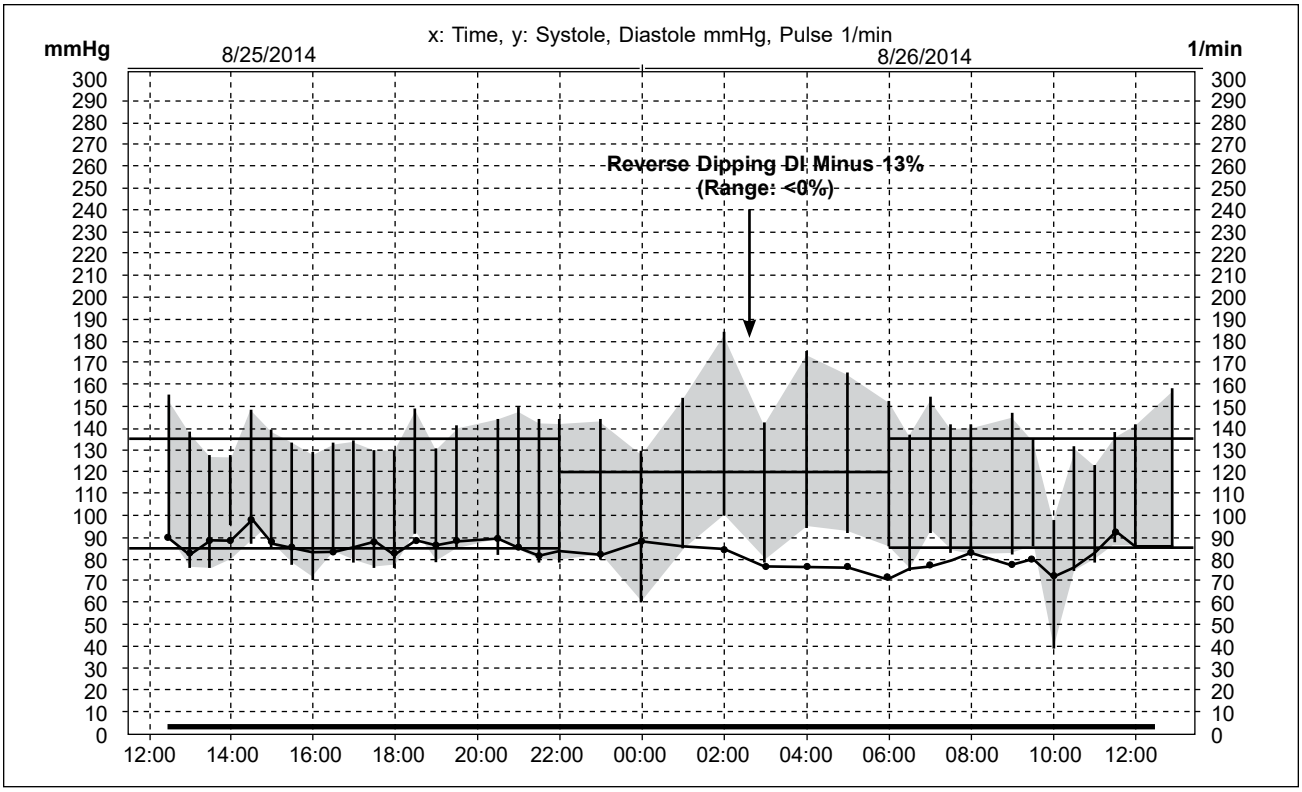

Figure 6. Reverse dipper.

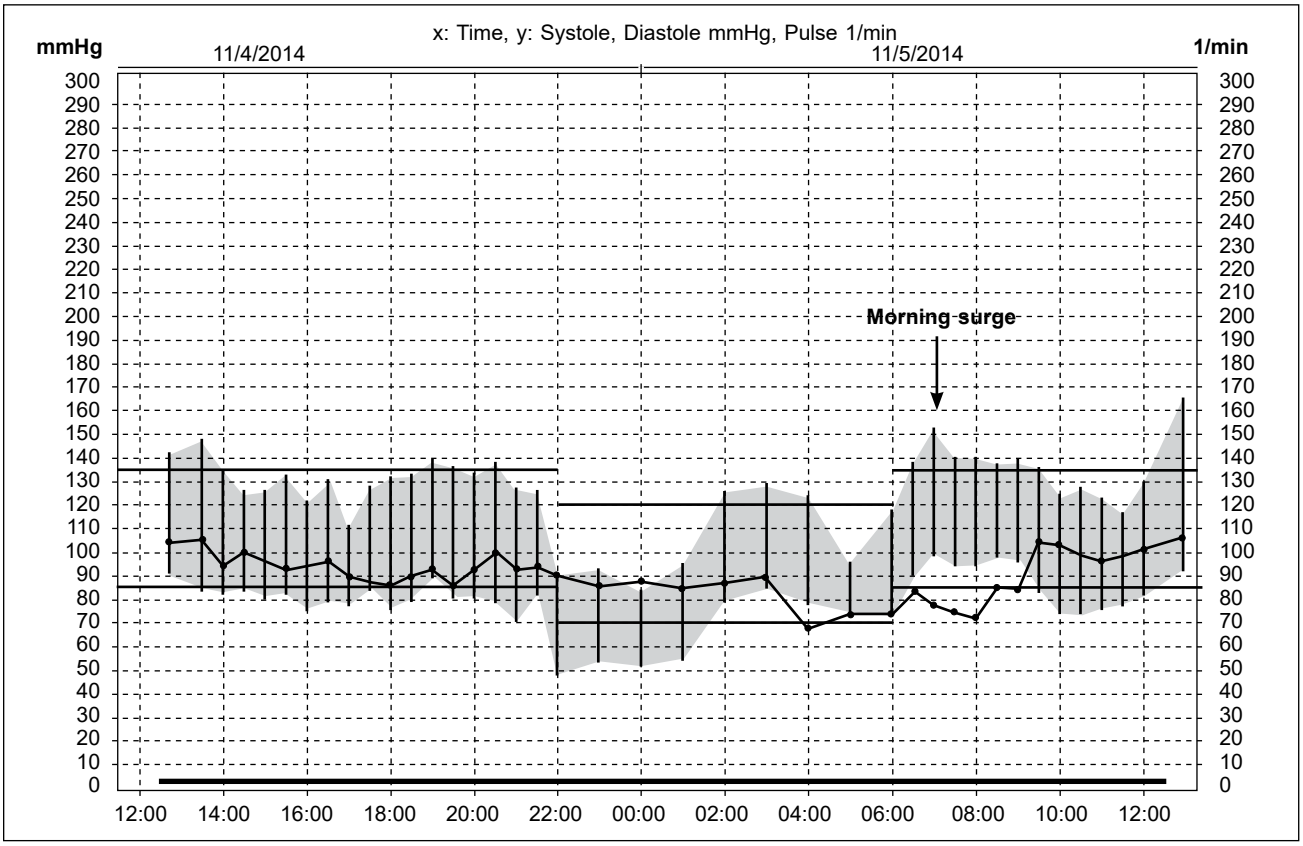

Figure 7. Morning surge.

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CLINICAL STUDY

A Study of Somatic Status and Complications Among Female Diabetic Patients from Mysore Urban Area

PRABHAVATHI SN*, CHARLOTTE G KARUNAKARAN†, ASHOKA HG‡

ABSTRACT

In recent years, India has undergone rapid urbanization and socioeconomic development. Changes in time trends have resulted in erratic lifestyle, characterized by physical inactivity, unhealthy eating habits and resultant increase in obesity and diabetes. Diabetes is a major cause of mortality and morbidity in India and its prevalence is increasing at an alarming rate. Chronic complications of diabetes, especially coronary artery diseases and chronic renal diseases results in frequent hospitalization. The main aim of the investigation was to study the somatic status and diabetic complications among the female hospitalized and non-hospitalized patients. A total of 80 female volunteers (40 hospitalized and 40 non-hospitalized) of a private hospital in Mysore, with known history of type 2 diabetes mellitus for more than 2 years, were recruited for the study. The tools were developed to collect information on personal history, demography, socioeconomic status, dietary habits and anthropometric measurements. Suitable statistical analysis was applied to the data. The results projected that majority of the patients were hospitalized on an average of at least three times a year. More than 90% of the subjects exhibited blood sugar >300 mg on admission. The reason for high morbidity status included poor dietary habits and erratic lifestyle practices among the female hospitalized patients as compared to non-hospitalized patients. Adapting a healthy lifestyle and maintenance of normal blood sugar level can reduce the incidence of complications and hospitalization among the subjects.

Keywords: Urbanization, socioeconomic development, obesity, diabetes, somatic status, diabetic complications, hospitalized and non-hospitalized patients

Diabetes is a multifactorial disease that combines hereditary and environmental factors. The prevalence of diabetes is increasing globally. Diabetes is pandemic in both developed and developing countries. In the year 2000, it was estimated that there are 175 million diabetics worldwide and expected to increase to 354 million by the year 2030.

Based on a compilation of studies from different parts of the world, World Health Organization (WHO) has projected that the maximum increase in diabetes would occur in India.[1] Presently, India is facing a major health care burden due to the high prevalence of type 2 diabetes as it is a major cause of mortality and morbidity in India, and is increasing at an alarming rate. Genetic predisposition superimposed by erratic lifestyle - physical inactivity, unhealthy eating habits is one of the major causes for increase of diabetes in India. The prevalence of type 2 diabetes is found to be 4-6 times higher in the urban areas as compared to rural areas.

The onset of diabetes among Indians is about a decade earlier than their western counterparts and this has been noted in Asian Indians in several studies. Studies show that among urban Asian Indians even minor changes in body mass index (BMI) central adiposity tilts the metabolic balance towards hyperglycemia/insulinemia. Asian Indians are said to have higher upper body adiposity measured as waist-hip ratio (WHR). The cut-off values for normal waist circumference were 80 cm and 0.8 for WHR among women.[2]

The cardiometabolic risk associated with abdominal obesity is attributed to the presence of visceral adipose tissue (VAT), which promotes insulin resistance, dyslipidemia and hypertension.[3-5] A national survey of diabetes in the year 2000 conducted in six major cities in India reported 54.1% of diabetes developed in most productive years of life and had higher risk of developing complications of diabetes.[6,7]

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Asian dyslipidemia is characterized by high serum levels of triglycerides (TG) and lipoprotein a {Lp(a)}, borderline high levels of low-density lipoprotein (LDL) and low levels of high-density lipoprotein (HDL) cholesterol.

Asian Indians have high ratio of total cholesterol (TC) to HDL, TG/HDL and apoB/apoA.[8-10] These ratios are highly correlated with premature incidence and severity of coronary artery disease (CAD) as well as acute myocardial infraction among Asian Indians. On an average, diabetic patients stay in the hospital 1-3 days longer than patients without diabetes. The prevalence of micro- and macrovascular complications were more in Asians when compared to Europeans. Acute and chronic complications of diabetes, especially cardiovascular diseases (CVDs), results in hospitalization of many patients with diabetes.[11] The projections of the present study throw light on the Mysore female diabetic subjects and can be used to develop prevention strategies by consulting physicians.

METHODOLOGY

A total of 80 volunteers (40 non-hospitalized and 40 hospitalized) with known history of type 2 diabetes mellitus for more than 2 years were recruited for the study. Volunteers willing to participate and belonging to the age group of 30-70 years with no history of hormonal therapy or hyperthyroidism were included as subjects. Anthropometric measurements like height, weight, mid-upper-arm circumference (MUAC), triceps skin fold (TSF), were recorded using standard procedures.[12] Indices viz. BMI, WHR were calculated as an index of obesity. Biochemical assessment included fasting blood sugar (FBS), postprandial blood sugar (PPBS) and lipid profile. The values were recorded from the medical record of the patients. A pretested questionnaire was applied to elicit information.

Description of the methods applied to collect the data is given below.

Anthropometric Measurements

- **Height (cm)** was measured with the subject standing, back to a stadiometer in the base feet. Feet were kept parallel with the heels together. The moving arm of the stadiometer was lowered to touch the top of the head and height was measured to the nearest 1.0 mm.
- **Weight (kg)** was measured to the nearest 0.005 kg with a weighing machine, which was calibrated daily by using known 5 kg weights.
- **MUAC (cm)** was measured on the right arm at the point between the tip of shoulder and tip of olecranon in the elbow bent at 90°.
- **Skin fold thickness (mm)** was measured according to the protocol described by Durmin and Womersley (1) using skin fold calipers (beta-technology incorporated; USA).
- **Triceps skin fold (mm)** was measured at mid-point of right arm elbow, bent at 90° on the lateral side.
- **Waist circumference (cm)** was measured midway between the lateral ribs and iliac crests. The subjects were asked not to tuck their stomach in, and the measurement was taken in gentle expiration. Their clothes were loosened around the waist area.
- **Hip circumference (cm)** was measured at the widest part over the trochanters with the feet kept 25-30 cm apart.

Statistical Analysis

The collected data was compiled for obtaining mean ± SD. Student *t*-test was used for comparison of groups. All the analysis was done using windows based SPSS statistical package (version 11.0). Significant figures used; $0.05 < p < 0.10$* Moderately significant, $0.01 < p \leq 0.05$** Strongly significant $p \leq 0.01$.

RESULTS

The baseline characteristics of the subjects are shown in Table 1. From among the 80 subjects, 40 were hospitalized and the other 40 non-hospitalized. The mean age of the subjects was 57 (hospitalized) and 60 (non-hospitalized) years. Majority of the subjects from both the groups (74%) reported to have family history of diabetes. It was observed that majority (32%) of hospitalized subjects developed diabetes at an younger age (35-45 years), while among the non-hospitalized subjects the onset was after 45 years of age (37%).

A considerably higher percentage of the subjects were found to have basic primary school education (40%) and 30% were illiterate. High majority (47%) of the subjects were found to be daily wagers and were economically backward and belonged to the among the hospitalized group. Diet history showed that a high percentage (68%) of the subjects were nonvegetarians. It is noteworthy to mention that a significantly higher mean body weight ($p = 0.031$) and BMI ($p = 0.005$) was seen among the hospitalized subjects while, TSF (0.038) was significantly higher among the non-hospitalized subjects. Waist circumferences was above the normal cut-off level (>80 cm) recommended for Asian Indians in both the groups.

Table 1. Baseline Characteristics of the Subjects

	Hospitalized (n = 40)	Non-hospitalized (n = 40)	Total (n = 80)
Age (years)			
≥35-<45	4 (10)	3 (7)	7 (8.7)
≥45-<55	10 (26)	9 (23)	19 (23.7)
≥55-<65	13 (32)	12 (30)	25 (31.3)
>65	13 (32.5)	16 (40)	29 (36.3)
Age of onset of diabetes			
≥35-<45	13 (32)	07 (18)	25 (20)
≥45-<55	08 (20)	15 (37)	29 (23)
≥55-<65	12 (30)	8 (20)	25 (20)
>65	07 (18)	10 (25)	21 (17)
Marital status			
Married	40 (100)	40 (100)	80 (100)
Unmarried	-	-	-
Education			
Illiterates	10 (25)	13 (32.5)	24 (30)
1-7th	14 (35)	10 (25)	18 (22.5)
8-10th	8 (20)	10 (25)	15 (18.7)
PUC and above	8 (20)	7 (17.5)	23 (28.8)
Family history of diabetes mellitus			
Yes	30 (75)	29 (73)	59 (74)
No	10 (25)	11 (27)	21 (26)
Income			
≥5,000	4 (10)	-	4 (5)
10-20,000	19 (47.5)	9 (22.5)	28 (35)
20-40,000	8 (20)	11 (27.5)	19 (23.8)
40-60,000	4 (10)	12 (30)	16 (20)
>60,000	5 (12.5)	8 (20)	13 (16.2)
Type of diet			
Vegetarians	14 (35)	12 (30)	26 (32)
Non-vegetarians	26 (65)	28 (70)	54 (68)

Protein status as indicated through MUAC was within the normal range (Table 2).

Different comorbid conditions of the subjects are presented in Table 3. Sixty-two percent of the hospitalized subjects had myocardial infarction as a major complication. The mean duration of diabetes among these subjects was found to be 8 years.

Among the non-hospitalized subjects, though the duration of diabetes was longer, complication of myocardial infarction was found only in 22% of the subjects. Among the subjects, chronic obstructive pulmonary disease (COPD) appeared to be a common complication in both the groups. It was observed that subjects having diabetes for more than 15 years developed chronic kidney diseases (CKDs), which accounted for 13% among hospitalized and 7% in non-hospitalized subjects.

Table 2. Mean ± SD Anthropometric Measures and Indices

Parameters	Hospitalized patients (n = 40)	Non-hospitalized patients (n = 40)	P value
Height (cm)	157.4 ± 5.4	157.4 ± 5.8	1.000
Weight (kg)	63.2 ± 10.1	58.8 ± 7.5	0.031
BMI (kg/m^2)	25.9 ± 4.2	23.6 ± 2.9	0.005
Waist (cm)	88.6 ± 10.5	85.8 ± 6.1	0.219
WHR (cm)	0.83 ± 0.04	0.81 ± 0.03	0.204
MUAC (cm)	28.0 ± 3.7	26.8 ± 2.6	0.093
TSF (cm)	19.6 ± 2.7	20.9 ± 2.8	0.038

Table 3. Complications and Duration of Diabetes

Hospitalized patients			Non-hospitalized patients	
Complications	**n**	**Duration of diabetes**	**n**	**Duration of diabetes**
Myocardial infarction	25	8	9	12
COPD	10	5	10	8
CKD	5	>15	3	>15

The correlation of somatic measures with biochemical parameters are presented in Table 4. Significant associations were observed in hospitalized subjects against various body and biochemical parameters. Higher BMI showed significant association with TC and LDL. Hip circumference showed inversely significant relationship with LDL. BMI showed moderately significant association with FBS only in non-hospitalized subjects (Table 5).

Correlation between various biochemical parameters are shown in Table 6. Significant association was found between FBS and TG only among hospitalized subjects. Those with high FBS also had high PPBS among the hospitalized subjects. While among non-hospitalized subjects PPBS was highly significant with HDL. TG showed significant correlation with TC and LDL among only the non-hospitalized subjects.

Table 4. Mean Biochemical Parameters of the Subjects

Biochemical parameters (mg)	HP	NHP	't' value	P value
TC	199.5 ± 36.7	198.0 ± 35.8	0.179	0.858
HDL	46.4 ± 13.2	40.4 ± 7.4	2.57	0.012
LDL	119.6 ± 31.2	112.7 ± 30.4	1.00	0.315
TGs	157.1 ± 59.9	146.4 ± 35.8	0.98	0.331
FBS	176.7 ± 68.3	158.0 ± 23.5	1.63	0.107
PPBS	326.2 ± 99.8	267.2 ± 62.7	3.16	0.002

HP = Hospitalized; NHP = Non-hospitalized; TGs = Triglycerides.

Table 5. Correlation for Somatic Measures

Parameters		Hospitalized patients	Non-hospitalized patients
BMI	TC	0.016*	NS
	LDL	0.015*	NS
	FBS	NS	0.041*
	PPBS	NS	NS
Hip circumference	LDL	0.018*	NS
WHR	LDL	0.038*	NS
TSF	LDL	0.042*	NS

*Moderately significant, NS = Not significant.

Table 6. Correlation of Biochemical Parameters

Parameters		Hospitalized patients	Non-hospitalized patients
FBS	TG	0.016*	
	PPBS	0.0002**	
PPBS	HDL		0.004**
TG	TC	NS	0.0001**
	LDL	NS	0.001**

**Highly significant.

DISCUSSION

Epidemiological studies conducted in southern India show a steady increase in the prevalence of diabetes in the urban population. The earlier reports from Chennai showed a male preponderance in the prevalence of diabetes, which in subsequent years had shifted slightly towards a female excess.[6,7,13-16] In India, nearly 75% of the type 2 diabetics have first-degree family history of diabetes indicating a strong familial aggregation. Risk factors for developing type 2 diabetes, peculiar to the Indian population, are high familial aggregation, central obesity, insulin resistance and lifestyle changes due to urbanization.[17]

Insulin resistance has been demonstrated to be a characteristic feature of Asian Indians. In the present study, the onset of diabetes was found to be between the age groups of 35-45 years and all the subjects reported family history of diabetes. The mean age of onset of diabetes was found to be 35 years. Several studies on the Asian population reveal that the onset of diabetes is seen before the age of 50 years and at the time of diagnosis of diabetes most of them had developed micro- and macrovascular complications.[18] Familial aggregation, a typical feature of the Indian population, could be one of the cause for early onset of diabetes among the subjects.

The three urban diabetic surveys conducted in 1989, 1995 and 2000 in randomly collected areas in the city of Madras (now known as Chennai) reported no significant time-related change in the prevalence of obesity as measured by BMI.[7,13] Analysis of these surveys showed, that among the diabetic women, a higher percentage had BMI of 23-24.9 kg/m^2.[19] The normal cut-off values for Asian Indians are below 23 kg/m^2. A BMI of ≥25 kg/m^2 has been considered to indicate different grades of obesity. In the present study, the hospitalized patients had a mean BMI of 25.9 and 23.6 among the non-hospitalized subjects.[7] A peculiar pattern was observed among the study population that, there was no significant association between BMI and PPBS in the hospitalized subjects while, non-hospitalized subjects had significant association with only FBS. Studies show that the factors, which influence the BMI and the WHR have also frequently lacked specificity with respect to women.[7,13]

Central obesity is common among Indians despite low rates of general obesity and this android pattern of body fat typified by more upper body adiposity measured as WHR was found to be a greater risk factor as compared to general obesity. The cut-off values for normal waist circumference are 80 cm and 0.8 for WHR in women.[20-22] Asian Indians have higher upper body

adiposity measured as WHR. This has been suggested to be a superior predictor of CVD risk because it includes a measurement of hip circumference, which is inversely associated with dysglycemia, dyslipidemia, diabetes, hypertension, CVD and death.[23-27] The present study population also exhibited higher WHR as compared to the Asian standards. This could be one of the major causes for dyslipidemia exhibited by the subjects. Increasing evidence suggests that waist and hip circumferences have independent and opposite associations with glucose and lipid levels and risk of diabetes and CVD.[28,29]

Study by Ramachandran et al[17] has reported that Asian Indians require higher levels of plasma insulin to maintain normoglycemia; they also have other features of insulin resistance such as central obesity and high percentage of body fat in comparison to many other populations. Significant association was found between various lipid profile parameters and blood sugar levels in hospitalized subjects, while for non-hospitalized subjects PPBS was strongly associated with HDL and TG with TC and LDL. Based on the available published data there is a paucity of reliable data on diabetes related complications among people worldwide. A common complication of diabetes and the most common cause of mortality in people with diabetes is CVD.[18] This was prominently seen among hospitalized subjects who had blood sugar levels of >300 mg% on admission. The most common complications seen was myocardial infarction followed by COPD and CKD. Among the subjects majority were hospitalized on an average of at least 3 times a year. The reason for hospitalization included; myocardial infraction, COPD and/or nephropathy. More than 90% of the subjects exhibited blood sugar >300 mg on admission despite being on oral hypoglycemic agents. Evaluation of elevated blood sugar revealed-poor dietary habits, irregular meal timings, festive occasions, physical inactivity and poor morbidity status.

CONCLUSION

The main findings of the study were that, majority of the subjects had onset of diabetes mellitus at the mean age of 35 years. This early onset of diabetes will result in higher diabetes related complications at an earlier age, which can lead to increased mortality in the productive years of life. There is an urgent need to prevent diabetes and its complications rather than simply treat it once established. Patients should be educated for lifestyle changes such as weight control, increased physical exercise and smoking cessation, which are potentially beneficial in preventing diabetes mellitus and CAD. The limited data available on gender-wise, region-wise diabetes complication rates highlight the need for nation-specific and population-specific studies. Furthermore, the morbidity and mortality caused by diabetes mellitus can be reduced by secondary prevention through regular screening, early detection and appropriate treatment of chronic complications.

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CLINICAL STUDY

Predicting Clinical Outcome in Diabetics versus Nondiabetics with Acute Myocardial Infarction After Thrombolysis

AMGOTH BANU PRIYA*, ARUN PRASATH*, C RAMAKRISHNAN†, SM RAJENDRAN‡

ABSTRACT

Acute myocardial infarction can be considered as a potential epidemic for mankind (WHO 1982). Diabetes mellitus is one of the 6 primary risk factors identified for myocardial infarction. The aim of our study was to correlate the incidence of complications with diabetes by using ST segment resolution as a tool, thereby re-enforcing the role of incomplete ST resolution as a marker of worse clinical outcome in cases of diabetes with ST-elevated myocardial infarction in our population.

Keywords: Acute myocardial infarction, thrombolysis, ST segment elevation, reperfusion

The acute coronary syndrome includes unstable angina, non-ST segment elevation myocardial infarction (NSTEMI) and ST segment elevation myocardial infarction (STEMI). Diabetes mellitus is one of the 6 primary factors identified for myocardial infarction (MI), others being dyslipidemia, smoking, male gender, hypertension and family history of atherosclerotic arterial disease. Diabetes mellitus is a metabolic disorder which increases the rate of atherosclerosis progression of vascular occlusion.[1] Even after prompt thrombolysis, the aftermath of diabetic patients is still worse than the nondiabetics, indicating impaired post-thrombolysis left ventricular function and prognosis.

The aim of thrombolysis in acute MI is early and complete myocardial reperfusion.[2] Incomplete or failed reperfusion is associated with increased risk of complications. Analysis of ST segment resolution on electrocardiogram (ECG), after fibrinolytic therapy, in cases of STEMI, offers an attractive and cost-effective solution to assess coronary reperfusion. Whereas coronary angiogram is a marker for epicardial reperfusion, ST segment resolution offers a better reflection of microvascular reperfusion. Although successful thrombolysis of the epicardial vessel is necessary for good prognosis, but the microvascular flow more strongly correlates with the outcome. ST segment is, therefore, a better indicator of prognosis, and provides information, which cannot be assessed on basis of coronary angiogram alone.[3,4] In fact, Schröder et al,[5] reported that absence of ST segment resolution was the most powerful independent predictor of early mortality ($p = 0.0001$).

ST resolution can also be used as a tool to identify candidates for early invasive procedures such as percutaneous transluminal coronary angioplasty (PTCA), who are at risk of developing complications because of nonresolution of ST segment after initial thrombolytic therapy.[6] Since, ECG is widely available even in developing nations, it is important to establish its effectiveness as a tool for assessing reperfusion as it will offer the cheapest alternative for assessing recovery and myocardial salvage.

MATERIAL AND METHODS

The prospective study was conducted at Sree Balaji Medical College and Hospital, Chennai from June 2015 to October 2015. All cases of acute MI with the diagnosis based on the World Health Organization

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(WHO) criteria i.e., presence of any 2 of the following were included.

- Chest pain consistent with acute MI of less than 24 hours duration.
- Electrocardiography changes i.e., ST segment elevation >0.2 mV in at least 2 contiguous chest leads or >0.1 mV in at least 2 contiguous limb leads.
- New or presumably new left bundle branch block on ECG.
- Raised levels of cardiac enzymes creatine phosphokinase-MB more than double of the reference value or positive troponin I test done with commercially available kits of trop I.

These patients came within 12 hours of chest pain and received streptokinase on presentation. Patients coming after 12 hours of chest pain and patients suffering from type 1 diabetes mellitus were excluded.

The study population was divided into two groups: Group A, nondiabetics (n = 50) and Group B, diabetics (n = 50).

Only those patients who were known cases of diabetes or in whom it was established during hospital stay by repeated blood glucose estimation, were included in Group B.

A detailed history was taken, particularly of age, sex, occupation, address, history of smoking, diabetes mellitus, hypertension and family history of ischemic heart disease. Complete physical examination of patients was done upon presentation in emergency and important parameters such as pulse and blood pressure were noted. Patients were followed up daily. Pulse, ECG changes and complications, if any, were monitored till death or discharge of the patient. The endpoint was a composite of recurrent ischemic chest pain, heart failure, arrhythmia or death.

Time from onset of chest pain to presentation of patient in emergency was noted through the history. ECG recordings of patients were taken upon presentation in emergency. ST elevation was recorded in millimeters from the lead in which maximum elevation was observed. Injection streptokinase was given intravenously to each patient at a dose of 1.5 million units, diluted in 100 mL of normal saline, in 1 hour.

Repeat ECG was performed after 60 minutes of administration of streptokinase (SK). ST resolution was observed in the lead with the maximum ST elevation. ST resolution was defined as a reduction of >50% ST segment elevation after thrombolysis. Informed written consent of the patient/attendant was taken. Follow-up was conducted for each patient throughout his/her hospital stay. Fasting plasma glucose (FPG) was recorded from all patients, in the morning of day following hospital admission for differentiating new cases of diabetes, stress hyperglycemia and nondiabetic. FPG measurements were repeated in stable condition prior to discharge from hospital. The patients were also assessed for the complications during the follow-up. The major complications assessed were: Recurrent ischemic chest pain, heart failure, arrhythmia and death. Recurrent ischemic chest pain was assessed on the basis of history and ECG; heart failure was assessed on the basis of clinical examination, chest X-ray and echocardiography. Arrhythmia was evaluated on the basis of continuous bedside monitoring of ECG. Tachycardia was defined as pulse rate >100 and bradycardia as ≤50/min.

Statistical Analysis

All data was analyzed by SPSS (statistical package for social sciences) version 12.0 for windows, chi-square test was used to compare the demographic characteristics and completion in both groups with 0.05% level of significance.

RESULTS

A total of 100 patients were investigated in this study, of which 70 (70%) were males and 30 (30%) were females. Table 1 shows the demographic characteristics of the study population at presentation. There was no significant difference in the comorbidities of the two groups with hypertension showing the most significant trend.

Table 1. Demographic Data at Time of Presentation

Demographic characteristics	Nondiabetic (Group A) (n = 50)	Diabetic (Group B) (n = 50)
Mean age	55.34 ± 14.38	58.30 ± 12.26
Gender		
Male	38 (76%)	32 (64%)
Female	12 (24%)	18 (36%)
Time of thrombolysis in hours	5.88 ± 1.0	5.07 ± 1.3
Hypertension	15 (30%)	26 (52%)
Hypercholesterolemia	10 (20%)	10 (20.2%)
Family history	9 (18.2%)	7 (14.8%)
Smoking	25 (50%)	24 (48%)

DISCUSSIONS

The time to reperfusion and complete reperfusion remain the key determinants for fibrinolysis. Historically, ST resolution has been one of the markers used to access reperfusion in STEMI. Its importance cannot be denied as a prognostic indicator and the results of our study also reinforce this fact. However, its use as a cost-effective marker has been under utilized. Several studies have reported similar angiographic[7,8] or ECG [9,10] success in both type 2 diabetic and nondiabetic subjects, while others have shown that the diabetics have less complete resolution of ST elevation than the nondiabetics.[11] To evaluate this issue, it has been hypothesized that type 2 diabetes might interfere with intravenous thrombolysis effectiveness, as estimated by angiographic or ECG criteria.

In our study, we observed that in nondiabetic MI 84% patients showed complete resolution and 16% showed failed resolution. But in case of diabetic MI, 13.8% patients showed complete resolution and 86% showed failed resolution. In our study, more complete ST resolution was seen in nondiabetic patient (84% vs. 16%, $p < 0.001$), whereas type 2 diabetic subjects presented with significantly higher incidence of failed ST resolution than nondiabetic subjects (88% vs. 14.8%, $p < 0.001$). This significant change in ST resolution between nondiabetic and diabetic group was similar with the study, which showed significant difference between nondiabetic and diabetic patients in relation to complete (35.1% vs. 69.2%, $p < 0.001$) and incomplete (66.8% vs. 32.6%, $p < 0.001$) resolution.[11] Our results are also consistent with a published meta-analysis in which it was shown that type 2 diabetic subjects had less ST resolution after intravenous thrombolysis administration compared with nondiabetic subjects.[7]

Our results showed the frequency of complications in nondiabetics to be 32.9% compared to 79.8% in diabetics ($p < 0.001$), which was substantially higher in the latter. This finding, therefore establishes a direct correlation between diabetics and the frequency of complications, reflected by less complete ST segment resolution in diabetics in our study (86%).

In our study, we noted that there was a significant interaction between diabetic status and failed ST resolution with respect to the occurrence of in-hospital recurrent ischemia ($p < 0.0001$). Recurrent chest pain is the most common complication observed in the study. A study supporting our results showed that there was a significant interaction between diabetics status and treatment strategy with respect to the occurrence of in-hospital recurrent inchemia.[12] In that study, 32.5% diabetics and 22.1% nondiabetics developed recurrent ischemia after fibrinolysis ($p < 0.001$). As shown by another study, diabetic patients may have a greater residual lesion in the infarct-related artery after treatment with fibrinolytics, resulting in a higher rate of recurrent ischemia.

In our results, we observed that the interaction between diabetics status and failed ST resolution with respect to the development of heart failure was significant ($p = 0.025$). Heart failure is the major determinant for prognosis after MI. Since, some patients never had an echocardiography before this hospital admission to rule out prior heart failure, so any indication of heart failure post-thrombolysis was considered a new development. Our results are supported by the findings of a study, which showed that in-hospital heart failure was more common among diabetics after fibrinolysis.[12] In that study, 10% diabetics and 4.2% nondiabetics developed heart failure ($p = 0.001$).

We observed arrhythmias in 56% of diabetic patients as compared to 10% in nondiabetic patients ($p < 0.0001$). The results clearly shows that arrhythmias are less frequent in nondiabetic patients. Failed ST segment resolution was associated with high frequency of occurrence of arrhythmias compared with complete resolution of both diabetics ($p < 0.0001$) and nondiabetics ($p < 0.0001$). Our results are supported by a study in which incidence of AV block and LBBB, detected in half of the dying patients, was 3 times more common in diabetics than in nondiabetics subjects.

In our study, mortality in diabetic group (only patients with failed ST resolution) was 6.4% compared to 0% in nondiabetic group ($p = 0.014$). A study supporting these findings was carried out by Timmer et al. According to their results, diabetes was associated with increased 30-day mortality. Diabetic mortality was 12.4% and nondiabetic mortality 6.9% after thrombolysis at 30-day endpoint. Small sample size of this study limits our conclusions. There was no post-hospital follow-up, so that is another weak factor of this study. Since, the hospital is equipped to deal with life-threatening emergencies, in-hospital death as a complication was not that high in any group.

The negative influence of diabetes on outcome after STEMI has been described previously. Because mortality remains particularly high in patients with diabetes after STEMI, it is important to define optimal treatment strategies including method of reperfusion therapy, in this population. In our study, it was proved

that reperfusion failed in a significant proportion of diabetic patients with STEMI in comparison with nondiabetic persons (86% vs. 16%). Similar results were obtained by Zairis et al.[11] They proved that fibrinolysis may be less effective in diabetic patients. Angeja et al[7] showed that microvascular flow is decreased in diabetic patients after fibrinolysis. Possibly, this is associated with increased platelet aggregation and reduced ability to induce endothelium-mediated vasodilation.

The higher risk of adverse events may be caused by enhanced thrombogenicity and impaired fibrinolysis. Percutaneous coronary intervention (PCI) can be a better alternative in diabetics presenting with acute MI. However, the long-term outcome of these patients depends on the extent of coronary disease and residual left ventricular function, as well as the presence of other risk factors. Hence, aggressive secondary preventive measures such as tight glycemic control and lipid-lowering may be just as important as the mode of reperfusion treatment for these patients.

So, due attention is required for the better management of diabetic MI patients. This should, however, be supplemented with further therapies and strategies directed towards the many abnormalities that are associated with diabetes, such as endothelial dysfunction, dysglycemia and coagulation and fibrinolytic disturbances.

Our study was limited by the fact that the prognosis after STEMI is affected by various factors such as age, gender, number of coronary risk factors presented by the patient, use of aspirin within 7 days and number of angina attacks the patient suffered. We could not assess these factors, which correlate strongly with mortality in our study. A multivariate analysis is required to exclude the importance of these confounding factors.

Stress hyperglycemia has a detrimental effect on thrombolytic outcome after acute MI. Diabetes can be differentiated from stress hyperglycemia with certainty only after the acute phase of the infarction. Thus, any attempt to identify undiagnosed diabetes in our study would have been biased because patients must survive the acute phase to be diagnosed. Another limiting factor was the nonrandomized nature of the research and small size of patients included in the study. In addition to this, it was also limited by the fact that it was a single center study.

CONCLUSION

Frequency of in-hospital complications is more in failed ST resolution compared to complete ST resolution, in both diabetics and nondiabetics, post-thrombolysis. Diabetic population, after thrombolytic therapy, has a higher incidence of adverse clinical outcomes than nondiabetics.

Among diabetic patients with acute MI, fibrinolysis was associated with less complete ST segment resolution, suggesting impaired microvascular flow. Abnormal microvascular flow may contribute at least in part to the poorer outcomes observed in patients with diabetes and acute MI.

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CLINICAL STUDY

One-Step versus Two-Step Diagnostic Test for Gestational Diabetes Mellitus

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ABSTRACT

Aim: Comparison between one-step Diabetes in Pregnancy Study Group India (DIPSI) and American Diabetes Association (ADA) recommended two-step oral glucose tolerance test (OGTT). **Material and methods:** This study has a sample size of 200; 100 participants each were subjected to either of the two tests. Gestational diabetes mellitus (GDM) and non-GDM diagnosed by one-step test versus two-step test, respectively, were compared to one another and results were compared on the basis of various antenatal complications and fetomaternal outcomes. **Results:** No statistical difference was found between both the groups on the basis of various antenatal and fetomaternal outcomes. **Conclusion:** In Indian subcontinent with poor resources and lack of follow-up, single-step DIPSI can be preferred to ADA recommended two-step OGTT; however, large database studies are still required.

Keywords: Gestational diabetes mellitus, Diabetes in Pregnancy Study Group India, one-step test, two-step oral glucose tolerance test

Diabetes mellitus is a disorder of carbohydrate metabolism. Diabetes complicating pregnancy has become more common worldwide. Gestational diabetes mellitus (GDM) refers to carbohydrate intolerance that is recognized or develops during pregnancy, irrespective of the treatment with diet or insulin. Women with a history of GDM have a higher risk of future diabetes, particularly type 2 diabetes, and the same holds true for their children.[1] Besides, any glucose intolerance in pregnant women without GDM has been linked with escalated adverse maternal and fetal outcomes. Thus, GDM should be considered as a key opportunity to develop, test and implement clinical strategies for the prevention of diabetes. Action taken at the right time to screen all pregnant women for glucose intolerance, achieve euglycemia and ensure adequate nutrition could help prevent the vicious cycle of passing on glucose intolerance from one generation to another.

In the Indian context, screening for diabetes becomes all the more crucial during pregnancy as Indian women have an 11-fold increased risk of developing glucose intolerance during pregnancy compared to Caucasian women.[2]

The world prevalence of diabetes among adults was around 6.4% in 2010, affecting 285 million adults and is estimated to increase up to 7.7% and 439 million adults by 2030. Abnormal maternal glucose regulation has been noted in nearly 3-10% of pregnancies.

Routine screening is required in the Indian subcontinent because of multifactorial pathology predisposing women to this pregnancy associated comorbidity, the associated risk factors and long-term side effects. Also to mention, the low-cost of screening in a country like India with limited resource availability.

The American College of Obstetricians and Gynecologists (ACOG) recommends universal screening for GDM with a 50 g 1 hour loading test at 24-28 weeks followed by 100 g, 3-hour oral glucose tolerance test (OGTT) for diagnosis. In this approach, a 50 g glucose challenge test, or the O'Sullivan test, is first performed which, if positive, is followed by an OGTT.[3]

After the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study, the World Health Organization (WHO) validated Diabetes in Pregnancy

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Study Group India (DIPSI) as a single step procedure in screening GDM. In the antenatal clinic, after preliminary examination, the pregnant women will be given 75 g glucose load orally, irrespective of her fasting status or timing of previous meal. GDM is diagnosed, if post 2-hour blood glucose value is found to be ≥140 mg/dL.[4-6] This single step procedure has been approved by the Ministry of Health, Govt. of India and also recommended by the WHO.

The International Association of Diabetes and Pregnancy Study Groups (IADPSG) in 2010 recommended new terminology and diagnostic cut offs for GDM based on the hyperglycemia and pregnancy outcome study. According to IADPSG guidelines, diabetes first recognized in pregnancy can be classified as gestational or overt. The criteria for diagnosing include:

- Fasting plasma glucose (FPG) ≥126 mg/dL
- Glycated hemoglobin (HbA1c) ≥6.5%
- Random plasma glucose >200 mg/dL.

Successful screening test requires that the condition should be prevalent in the target population (which diabetes is, in Indian subcontinent), screening improves the prognosis and available treatment is effective. There have been several screening guidelines based on the suitability of the test to the population characteristics, cost and screening accuracy. Numerous controversies still exist regarding the test to be used and when the screening strategy should be applied. Factors like clinical judgment and available resources have a key role in choosing the best possible mode for evaluation of GDM, the different screening and diagnostic practices for GDM, and in finally outlining the best suitable option for our economy and population. With so many routine screening options available for GDM, it becomes a challenge in itself for Indian obstetrics to choose the most suited testing method appropriate for a limited resource and poor follow-up economy like ours. Thus, this study was undertaken.

MATERIAL AND METHODS

Source of Data

It was a hospital-based study. All pregnant women in second trimester between 24 and 28 weeks of gestational age, who attend antenatal clinic at Shri Ram Murti Smarak Institute of Medical Sciences (SRMS-IMS), Bareilly, Uttar Pradesh, in a time of 2 years were enrolled in this study after providing informed consent.

Inclusion Criteria

- All consenting pregnant women in second trimester between 24 and 28 weeks who attended antenatal clinic at SRMS-IMS, Bareilly, Uttar Pradesh.
- Pregnant women of any parity.
- Singleton pregnancy.

Exclusion Criteria

- Pregestational diabetes.
- Chronic diseases/cardiac/hepatic/respiratory diseases/ any other medical or surgical diseases.
- Taking drugs that alter glucose metabolism.
- Patients who refuse to participate.

Method of Collection of Data

Study design: A clinical study.

Sample size: Two hundred consecutive pregnant women between 24 and 28 weeks of gestational age who attended antenatal clinic of SRMS-IMS, Bareilly, Uttar Pradesh, over a time period of 2 years were included in the study after providing informed consent and were randomized into two groups having 100 patients in each group.

Sample: It is a hospital-based study.

Place: SRMS-IMS, Bareilly, Uttar Pradesh.

Duration: Two years; from October 2017 to November 2019.

Method:

- A hospital-based clinical study designed to compare one-step versus two-step screening test for GDM. A detailed clinical assessment of patient was performed in the outpatient department (OPD), including history (family history of diabetes, history of previous pregnancies and socioeconomic status, etc.), general physical examination and obstetric examination. Routine investigations during antenatal visits were done. Informed consent of participation was taken during this initial assessment.
- A standard form was used to record the date of the tests performed, detailed clinical assessment of patient, including history and examination findings, investigations, including the test results.

Cut-off values of one-step procedure in screening of GDM:[5,6]

Criteria for Positive Screening of GDM	
DIPSI criteria for screening GDM	2-hour PPBS
Nonfasting OGTT with 75 g glucose	>140 mg/dL

The American Diabetes Association (ADA) recommends, in a two-step procedure, an initial screening by measuring plasma glucose 1 hour after 50 g oral glucose challenge test (OGCT). Those found to be positive at the screening test undergo 100 g OGTT.

ADA Criteria for Diagnosis of GDM

100 g OGTT	Cut-off values
Fasting	95 mg/dL (5.3 mmol/L)
1 hour	180 mg/dL (10 mmol/L)
2-hour	155 mg/dL (8.6 mmol/L)
3-hour	140 mg/dL (7.8 mmol/L)

Two or more of the venous plasma concentrations must be met or must exceed the above values for a positive diagnosis.

Patients who had a positive outcome to either of the screening tests were followed up in high-risk antenatal clinic. Outcome was noted during antenatal period, and as type of delivery, mode of delivery and postpartum events. Fetal outcome was observed. Under high-risk antenatal clinic, they were called for a follow-up fortnightly from 28 to 32 weeks, and weekly thereafter.

Standard management protocol for GDM was followed in patients screening positive by one-step or two-step technique.

Patients in whom the screening test came out negative were followed-up in regular antenatal clinic.

OBSERVATIONS AND RESULTS

This clinical study was conducted in the Dept. of Obstetrics and Gynecology, SRMS-IMS, Bareilly, Uttar Pradesh, India.

The aim of this study was to compare one-step versus two-step diagnostic test for GDM on the basis of various maternal, intrapartum and fetal parameters. A total of 200 antenatal women were recruited in this study; 100 women in each group.

The fetal, maternal and intrapartum outcomes of GDM patients and non-GDM patients of Group A and Group B were compared.

Out of 100 patients in Group A, 12 were found to have GDM by DIPSI criterion and rest 88 were taken as controls (Table 1). In Group B, 10 had GDM and rest 90 were taken as controls (Table 1). In our study, we found that the mean age of patients in Group A was 24.77 years and in Group B was 24.75 years. While comparing parity, as shown in Table 2, 39% and 37% patients in Group A and Group B were primigravidas, and 30% and 37% in Group A and Group B were second gravidas, respectively. Maximum patients in both the groups were either primi- or second gravidas. The mean body mass index (BMI) in patients of Group A was 21.708 kg/m^2 and in Group B was 21.018 kg/m^2. Maximum patients in both the groups had a BMI in the range of 20-25 kg/m^2 (Table 2).

While comparing genitourinary infections, the occurrence rate was 11.36% in non-GDM patients in Group A compared to 7.77% in Group B in the given antenatal period. On the contrary, 33.33% in patients with GDM in Group A and 20% patients with GDM in Group B were found to have genitourinary tract infections (Tables 3 and 4).

About 9.09% non-GDM patients in Group A and 8.88% non-GDM patients in Group B had gestational hypertension as an antenatal complication. Twenty-five percent of GDM patients in Group A and 30% of GDM patients in Group B had gestational hypertension as an antenatal complication (Tables 3 and 4).

Table 1. Case Distribution

Case distribution	DIPSI (Group A)	GTT (Group B)	P value
GDM	12	10	0.651
Non-GDM	88	90	
Total	**100**	**100**	

Table 2. Demographic Features

Demographic feature	Group A	Group B
Mean age	24.77	24.75
Mean BMI	21.708	21.018
Parity	P1-P2	P1-P2

Table 3. Maternal Complications in GDM Patients

Maternal complications	GDM (Group A)	GDM (Group B)	P value
Genitourinary infections	4 (33%)	2 (20%)	0.348
Gestational hypertension	3 (25%)	3 (30%)	1
Pre-eclampsia	4 (33.33%)	3 (30%)	1
PROM	4 (33.33%)	2 (20%)	0.646
Preterm delivery	3 (25%)	2 (20%)	1

About 10.22% of non-GDM patients in Group A and 6.66% of non-GDM patients in Group B had pre-eclampsia as an antenatal complication; 33.33% GDM patients in Group A and 30% patients in Group B had pre-eclampsia as an antenatal complication (Tables 3 and 4).

About 5.68% non-GDM patients in Group A and 6.66% non-GDM patients in Group B had premature rupture of membrane (PROM) complicated pregnancies; 33.33% GDM patients in Group A and 20% GDM patients in Group B had PROM as an antenatal complication (Tables 3 and 4).

About 6.81% non-GDM patients of Group A and 6.66% non-GDM patients of Group B had premature deliveries (<37 weeks). Twenty-five percent of GDM patients in Group A and 20% of GDM patients in Group B had premature deliveries (<37 weeks) (Tables 3 and 4).

Around 5.81% non-GDM patients in Group A had preterm vaginal delivery, 68.60% had full-term vaginal delivery and 25.58% had cesarean section (Table 5). None of the patients underwent instrumental delivery.

Table 4. Maternal Complications in Non-GDM Patients

Maternal complications	Non-GDM (Group A)	Non-GDM (Group B)	P value
Genitourinary infections	10 (11.36%)	7 (7.77%)	0.416
Gestational hypertension	8 (9.09%)	8 (8.88%)	0.962
Pre-eclampsia	9 (10.22%)	6 (6.66%)	0.393
PROM	5 (5.68%)	6 (6.66%)	0.785
Preterm delivery	6 (6.81%)	6 (6.66%)	0.968

Table 5. Mode of Delivery in Non-GDM Patients

Mode of delivery	Non-GDM (Group A)	Non-GDM (Group B)	P value
Preterm vaginal delivery	5 (5.81%)	4 (4.59%)	0.908
Full-term vaginal delivery	59 (68.60%)	59 (67.81%)	
Instrumental delivery	0 (0)	0 (0)	
Cesarean section	22 (25.58%)	24 (27.58%)	
Total	**86 (100%) + 2 (Stillborn)**	**87 (100%) + 3 (Stillborn)**	

In Group B, 4.59% non-GDM patients underwent preterm vaginal delivery, 67.81% had full-term vaginal delivery and 27.58% patients had cesarean section. None in Group B also underwent instrumental delivery; 2 stillborn deliveries in Group A and 3 stillborn deliveries in Group B were excluded from the above distribution.

Ten percent GDM patients in Group A and 11.11% GDM patients in Group B had preterm vaginal deliveries. Forty percent GDM patients in Group A and 44.44% GDM patients in Group B had full-term vaginal delivery. None of the patients in both the groups had instrumental delivery. Fifty percent in Group A and 44.44% in Group B had cesarean section, respectively. Two patients from Group A and 1 from Group B were excluded from the above case distribution as they had stillborn delivery (Table 6).

Two non-GDM patients of Group A and 3 non-GDM patients in Group B had intrauterine fetal demise or stillborn deliveries. Two out of 12 GDM patients of Group A and 1 out of 10 GDM patients of Group B had stillborn deliveries or intrauterine fetal demise (Tables 7 and 8). None of the non-GDM patients in both

Table 6. Mode of Delivery in GDM Patients

Mode of delivery	GDM (Group A)	GDM (Group B)	P value
Preterm vaginal delivery	1 (10%) + 2 (Stillborn)	1 (11.11%) +1 (Stillborn)	0.971
Full-term vaginal delivery	4 (40%)	4 (44.44%)	
Instrumental delivery	0 (0)	0 (0)	
Cesarean section	5 (50%)	4 (44.44%)	
Total	**10 (100%) + 2 (Stillborn)**	**9 (100%) +1 (Stillborn)**	

Table 7. Fetal Complications in GDM Patients

Fetal complications	GDM (Group A)	GDM (Group B)	P value
Stillborn	2 (16.66%)	1 (10%)	1
Shoulder dystocia	1 (8.33%)	0	1
Fetal malformations	1 (8.33%)	0	1
Respiratory distress	2 (16.66%)	2 (20%)	1
NICU admission	5 (41.66%)	4 (40%)	1

Table 8. Fetal Complications in Non-GDM Patients

Fetal complications	Non-GDM (Group A)	Non-GDM (Group B)	P value
Stillborn	2 (2.27%)	3 (3.33%)	1
Shoulder dystocia	0	0	1
Fetal malformations	0	2 (2.22%)	0.497
Respiratory distress	3 (3.40%)	3 (3.33%)	1
NICU admission	4 (4.54%)	7 (7.77%)	0.371

the groups had shoulder dystocia during delivery. One out of 12 GDM patients in the Group A and none of the GDM patients in the Group B had shoulder dystocia during delivery (Tables 7 and 8).

None of the non-GDM patients in Group A had fetal malformations, whereas 2 out of 90 in the non-GDM patients of Group B had this complication. One neonate born to GDM mother in Group A had congenital malformation at the time of birth. However, none of the neonates born to GDM mothers in the Group B had this complication (Tables 7 and 8).

About 3.40% neonates of non-GDM women in Group A and 3.33% neonates of non-GDM women in Group B had respiratory distress. Two out of 12 GDM patients in Group A and 2 out of 10 GDM patients in Group B had neonates with respiratory distress (Tables 7 and 8).

About 4.54% infants of non-GDM patients in Group A and 7.77% infants of non-GDM patients in Group B had neonatal intensive care unit (NICU) admission after delivery (Table 8).

DISCUSSION

Gestational diabetes mellitus refers to any degree of glucose intolerance which arises or is recognized for the first time during pregnancy. It may or may not undergo remission after the end of pregnancy. In comparison with European women, GDM prevalence has increased 11-times in women from the Indian subcontinent.[7] In this study, 100 patients underwent one-step diagnostic test for GDM between 24 and 28 weeks of pregnancy, and same number of comparable antenatal women were subjected to two-step procedure. The diagnostic accuracy appears to be the same by both the tests as the detection rate of GDM was statistically same with insignificant p value between the two groups.

Most of the women recruited in this study belonged to the age group of 21-25 years, thus indicating the increased awareness in the younger population toward antenatal check-ups and hospital delivery. A study done by Qadir et al,[8] had a higher incidence of GDM in higher age group women. In the study done by Priyanka,[9] it was noted that GDM cases belonged mostly to 26-30 years of age group. In our study, the distribution of cases according to parity showed that majority of cases i.e., 39%, were primigravida in Group A and 37% were primigravida in Group B. Only 5% women in Group A and 4% in Group B were of grand multiparity status. This further emphasizes our observation of willingness among young women for routine antenatal check-up, follow-up and institutional/hospital deliveries.

We observed that average BMI of GDM patients was 24.70 kg/m^2 in Group A and 24.51 kg/m^2 in Group B. However, a relatively lower mean BMI was observed in non-GDM patients of both the groups - 21.29 kg/m^2 in Group A and 20.63 kg/m^2 in Group B, respectively. The difference in BMI of both the groups was found to be statistically insignificant, but we observed a higher BMI in GDM patients as compared to the non-GDM patients.

In our study, we have compared the various feto-maternal and intrapartum complications of GDM in both the groups by applying different tests. No difference was observed between both the groups on comparing genitourinary complications. It was also noted that the incidence of genitourinary infections was much higher in the GDM when compared to non-GDM patients. In concordance with our study, a study done by Qadir et al also showed that the incidence of recurrent urinary tract infection and vulvovaginal infections in GDM patients is high when compared to non-GDM patients.

The incidence of gestational hypertension was observed to be much higher in GDM patients of Group A, i.e., 25% and of Group B (30%). In the non-GDM patients, the incidence was only 9.09% and 8.88% in both the groups, respectively (p = 0.962). Similar findings were noted on comparing the incidence of pre-eclampsia in GDM patients of both the groups with a p value of 1. In a study conducted by Sinha et al,[10] 22% of the DIPSI and 26% OGTT group had hypertensive disorders as comorbidity in their study. Similar to our study, this study also showed no significant difference in both the groups when the parameter hypertensive disorders was compared and an equal predictive value of GDM pregnancies complicated by hypertensive disorders was found by both the tests. Like our study, in the study conducted by Qadir et al, the frequency of hypertensive disorders was higher, though not statistically significant

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in the GDM patients. Also the parameter PROM was studied in the non-GDM and GDM patients of both the groups. The p value of both the groups in GDM and non-GDM patients was 0.646 and 0.785, respectively, suggesting no statistical difference and the groups to be comparable. Also, the incidence of the parameter was much higher in GDM patients. Similar to our study, a study conducted by Qadir et al also showed higher occurrence of PROM in GDM patients. When the incidence in the GDM and non-GDM patients of both the groups was compared, no statistical difference was observed. However, the incidence of preterm delivery was much higher in GDM group as compared to non-GDM (25% and 20% in GDM patients of Group A and Group B). Saxena et al found an incidence of 12%.[11]

The incidence of normal vaginal deliveries were noted to be lower in GDM patients - 40% in Group A and 44.44% in Group B. None of the patients in both the groups had an instrumental delivery as all the difficult deliveries were mostly subjected to cesarean section in our institute. When the rate of cesarean section was compared, it was found to be twice as much higher in the GDM group as compared to the non-GDM group. Unlike our study, a study conducted by Priyanka stated that 73.33% GDM patients had vaginal deliveries and only 19.44% had cesarean section. Like our study, in the study conducted by Sinha et al, 50% patients diagnosed with GDM by both the tests underwent cesarean and thus the tests were proved to be comparable.

Stillbirth and intrauterine fetal demise are known complications of GDM in the third trimester, as stated in literature. In this study, the incidence of stillborn deliveries in the non-GDM patients was observed to be 2.27% and 3.33% in Group A and Group B, respectively. However, in the GDM patients, the incidence was found to be much higher, 16.66% and 10% in Group A and Group B, respectively. On applying statistical tests, the difference between the two groups in both GDM and non-GDM patients was found to be insignificant. A study conducted by Priyanka, showed that GDM complicated pregnancies had live birth rate of 87.22% and intrauterine death was noted in 7.22% women. On studying the case distribution of shoulder dystocia in non-GDM and GDM patients of both the groups, none of the non-GDM patients had this complication during delivery; however, in GDM complicated pregnancies, 1 patient in Group A and none in the Group B had shoulder dystocia.

In our study, 2 out of 90 non-GDM patients in Group B and none in Group A had fetal malformations. In GDM pregnancies, the incidence rate of 8.33% was noted for the complication in Group A. However, none of the GDM pregnancies diagnosed by two-step test had fetal malformations. The study group was thought to be too small to draw a comparison between the GDM and non-GDM patients in regard to this parameter. On applying statistical tests, the value was found to be insignificant but not much relevant and the two groups were comparable. Sinha et al also found similar results.

On comparing the incidence of respiratory distress in infants of non-GDM group, it was found to be only 3.40% and 3.33% in Group A and Group B, respectively; however, diabetes complicated pregnancies had a much higher incidence of 16.66% and 20% in Group A and Group B. Lastly, on comparing the incidence of NICU admission in the two groups, 4.54% and 7.77% babies born to non-GDM mothers were admitted to NICU in Group A and Group B, respectively, immediately after birth. However, a very high incidence was observed in the babies of GDM mothers, i.e., 41.66% and 40% in Group A and Group B ($p = 1$). Like our study, in the study done by Sinha et al, 31% cases of DIPSI group and 45.50% cases of GTT group developed respiratory distress. Difference between the two was not statistically significant.

In this study, we have compared various complications of GDM in both the groups and we observed no statistical difference. Also, no difference exits in the diagnostic accuracy of both the tests. Similar to our study, the study conducted by Sinha et al also observed no statistical difference between one-step and two-step procedure in respect to various maternal and fetal outcomes.

CONCLUSION

The incidence of GDM in this study was found to be 12% by one-step and 10% by two-step procedure. The high pick up rate was attributed to our institute being a tertiary care center with maximum cases of complicated pregnancy. The statistical difference between both the groups in regard to all the parameters studied was found to be insignificant.

Hence, we state that one-step test, which is more feasible, economical and applicable in population of India, may help in fighting to diagnose GDM, reducing fetomaternal morbidity associated with it, in comparison to a more cumbersome and robust two-step diagnostic test recommended by the ACOG.

In our study, we compared and studied the statistical difference of various maternal, fetal and intrapartum

complications among two different groups. No statistical difference was observed between all the parameters assessed in this study. Thus, we conclude that both the tests not only have an equal predictive rate for various complications but also equally effective in diagnosing GDM. Timely diagnosis and management of GDM will prevent diabetes in future life. If adequate obstetric care is provided to the antenatal patients with GDM, many maternal, fetal and intrapartum complications can be markedly reduced, especially in low resource countries like India.

Thus, we suggest that ACOG recommended two-step test, which is less feasible and applicable in Indian population can be safely replaced by one-step diagnostic test. However, to state such a fact, large scale studies, exhaustive follow-up and meta-analysis is required. For us, as clinicians, it's our role to fight against all odds in converting the Diabetes Capital of the World to a well-controlled diabetic country.

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Soul does not Leave the Body Immediately After the Death

KK AGGARWAL

According to Prashna Upanishad, at the time of death, the Prana Vayu (life force and respiration) merges with Udana Vayu (brainstem reflexes) and leaves the body. But this does not happen immediately after clinical death, which is defined as stoppage of heart and respiration. Medically, the term used for clinically dead patients is sudden cardiac arrest.

As per modern medicine, in cardiac arrest, the brain does not die for the next 10 minutes and during this period, if the heart can be revived, life can be brought back.

The revival of patient during this period can be remembered by the "Formula of 10": Within 10 minutes of the stoppage of heart (cardiac arrest), if effective chest compressions are given for the next 10 minutes with a speed of 100 per minute (10 × 10), 80% of the cardiac arrest victims can be revived.

This period can be much longer in hypothermia state. If the temperature of the body is low, the soul does not leave the body till the temperature is brought back to normal. Today, this property of soul is also used as therapeutic measure where patients who cannot be revived in the first 10 minutes of clinical death are put in a freezing chamber and artificial hypothermia is produced and these patients can then be transported to an advance cardiac center where even after 24 hours, resuscitation measures can be applied after rewarming the body. Many people have been revived even after 24 hours of cardiac arrest with such a technology.

There are instances in literature where a newborn with hypothermia was declared dead but revived in the cremation ground when the environment heat brought the body temperature to normal and the pressure of the wood worked like cardiac massage.

This aspect of "life after death" is a contribution of the modern science to the Vedic science. Though in Vedic literature, it was a well-known phenomenon as Savitri brought life back into Satyavan even after his clinical death.

Take home message is that one should not declare a patient dead in the first 10 minutes; give cardiac massage and try reviving him with chest compression cardiopulmonary resuscitation (CPR).

(Disclaimer: The views expressed in this write up are my own.)

Group Editor-in-Chief, IJCP Group

INSPIRATIONAL STORY

Life is All About Choices

Michael is the kind of guy you love to hate. He is always in a good mood and always has something positive to say. When someone would ask him how he was doing, he would reply, "If I were any better, I would be twins!"

He was a natural motivator. If an employee was having a bad day, Michael was there telling the employee how to look on the positive side of the situation. Seeing this style really made me curious, so one day I went up to Michael and asked him, "I don't get it! You can't be a positive person all of the time. How do you do it?"

Michael replied, "Each morning I wake up and say to myself, you have two choices today. You can choose to be in a good mood or … you can choose to be in a bad mood. I choose to be in a good mood." Each time something bad happens, I can choose to be a victim or… I can choose to learn from it. I choose to learn from it.

Every time someone comes to me complaining, I can choose to accept their complaining or… I can point out the positive side of life. I choose the positive side of life. "Yeah, right, it's not that easy," I protested.

"Yes, it is," Michael said. "Life is all about choices. When you cut away all the junk, every situation is a choice. You choose how you react to situations. You choose how people affect your mood. You choose to be in a good mood or bad mood. The bottom line: It's your choice how you live your life."

I reflected on what Michael said. Soon hereafter, I left the Tower Industry to start my own business. We lost touch, but I often thought about him when I made a choice about life instead of reacting to it.

Several years later, I heard that Michael was involved in a serious accident, falling some 60 feet from a communications tower. After 18 hours of surgery and weeks of intensive care, Michael was released from the hospital with rods placed in his back.

I saw Michael about 6 months after the accident. When I asked him how he was, he replied, "If I were any better, I'd be twins. Want to see my scars?" I declined to see his wounds, but I did ask him what had gone through his mind as the accident took place. "The first thing that went through my mind was the well-being of my soon-to-be born daughter," Michael replied.

"Then, as I lay on the ground, I remembered that I had two choices: I could choose to live or… I could choose to die. I chose to live."

"Weren't you scared? Did you lose consciousness?" I asked.

Michael continued, "… the paramedics were great. They kept telling me I was going to be fine. But when they wheeled me into the ER and I saw the expressions on the faces of the doctors and nurses, I got really scared. In their eyes, I read 'he's a dead man'. I knew I needed to take action."

"What did you do?" I asked. "Well, there was a big burly nurse shouting questions at me," said Michael. "She asked if I was allergic to anything. 'Yes, I replied.' The doctors and nurses stopped working as they waited for my reply. I took a deep breath and yelled, 'Gravity'." Over their laughter, I told them, "I am choosing to live. Operate on me as if I am alive, not dead!"

Moral of the story: Michael lived, thanks to the skill of his doctors, but also because of his amazing attitude. I learned from him that every day we have the choice to live fully. Attitude, after all, is everything. After all, today is the tomorrow you worried about yesterday.

Life is about the little choices we make every day!

(Source: Broken Seed, Broken Child By Shiloh).

■■■■

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Books

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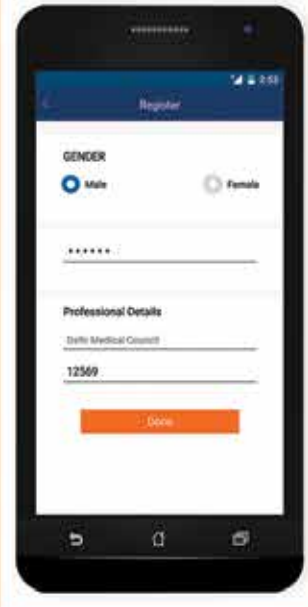

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