



INVESTIGATIONS FOR THE IMPACT OF MODIFIABLE AND NON MODIFIABLE RISK FACTOR ON DIABETES MELLITUS: A QUASI-EXPERIMENTAL STUDY IN KRISHNA DISTRICT ANDHRA PRADESH, INDIA

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ABSTRACT

Introduction: In the modern days, diabetes is not only a metabolic disease but it is more likely a pathophysiological condition affects complete health of an individual. Diabetes mellitus is defined as complex metabolic disease and associated with several triggers/risk factors. Hence the management of diabetes requires a comprehensive approach where diet, exercise and medications all are required. **Materials and Methods:** The present study was carried out in Vijayawada Krishna District, Andhra Pradesh, India. Vijayawada is the primary hub for health care in Andhra Pradesh and well educated city. The aim of present study is to examine the complications of Diabetes in the population, additionally the study also conduct a scientific validation on magnitude of Diabetes mellitus with different interventions. **Results:** The target population for the present study was the individuals visiting the Outpatient department of the diabetes hospital. A total of 250 respondents, were included in the study. The primary objectives of this research were to evaluate the severity of type 2 diabetes in the target group and determine how well therapies have succeeded in managing it. **Conclusion:** Parameters of glycemic management (such as HbA1c levels), compliance with changes in diet and lifestyle, and the overall outcome of managing diabetes represent a few of the significant diabetes-related parameters that will be examined in this study.

KEYWORDS : Diabetes mellitus, diet, diagnosis, nutrition, education. Survey and patient group.

INTRODUCTION

Over the years, there has been a steady rise in the prevalence of diabetes mellitus around the world, which has now reached dangerous proportions. The International Diabetes Federation (IDF) estimates that 537 million persons (aged 20 to 79) globally had diabetes as of 2021. It's important to remember that these numbers only include diagnosed cases of diabetes; there may also be a sizable number of undiagnosed cases. (1) An aging population, poor diets, sedentary lifestyles, and obesity are the main causes of the increased prevalence of diabetes. If diabetes is not effectively managed, it can lead to serious health risks and complications, such as cardiovascular disease, renal disease, eye issues, nerve damage, and a higher risk of infections. The major sections of people are living with type 2 diabetes mellitus, while about 10% have type 1 diabetes mellitus. Both types are responsible for about 12% of annual deaths in the United States alone, which highlights the magnitude of this condition. (2). Unfortunately, lifestyle changes and accelerated population aging, the incidence of diabetes mellitus is increasing. Today, there are 424.9 million adults with diabetes mellitus worldwide and this number is expected to grow. In China, for example, the number has reached 114 million, with more than 90% of those having type 2 diabetes mellitus. (3). Diabetes mellitus has a significant and rising economic cost, including its (4).

Complications from diabetes are a major cause for concern, with microvascular complications being particularly lethal and disabling for patients. Managing diabetes is a challenging task that requires regular monitoring of blood sugar levels and careful attention to nutrition. In the Philippines, approximately 7.2% of the population is diagnosed to have diabetes, and its prevalence continues to increase as obesity escalates. To manage type 2 diabetes mellitus, people must adopt and maintain self-care behaviors such as proper nutrition to achieve optimal metabolic outcomes and prevent medical complications (5). Diabetes mellitus affects millions of people worldwide, causing hyperglycemia and diabetes complications that negatively impact the quality of life of those diagnosed and place an economic burden on society. Thus, diagnosis, treatment, and prevention of diabetes and its complications is crucial. Type 2 diabetes mellitus is currently very common due to the prevalence of obesity and the aging of the population. Prevention and treatment strategies for the complications of diabetes have significantly improved, but more education regarding the disease is necessary. (6) Magnitude of diabetes mellitus cannot be overstated, as it affects millions of people worldwide. (7) Effective management of diabetes mellitus requires a multifaceted approach, including lifestyle modifications and medication adherence.

Dietary management also plays a critical role in diabetes management, as it helps patients understand how different foods affect their blood

sugar levels and make healthier dietary. (8) A healthy diet should be a priority for everyone, but it is particularly important for individuals with diabetes. A dietary assessment tailored to individual needs is crucial for developing an effective treatment plan for diabetes patients, as it takes into account their unique nutritional requirements and overall health status. (9) Non-clinical interventions such as stress management, physical exercise and community support can also contribute significantly to diabetes management. For example, regular physical activity can help regulate blood sugar levels and reduce the risk of developing cardiovascular complications associated with diabetes. Self-management education is also an essential aspect of diabetes management, as it involves teaching patients how to manage their condition and optimize metabolic control. In addition to clinical treatments, non-clinical approaches like stress relief techniques, exercise routines and community assistance can also make a significant impact in managing diabetes. For instance, consistent physical activity aids in controlling blood glucose levels and lessening the likelihood of cardiovascular ailments that are linked with diabetes. (10) In order to effectively manage diabetes, it is important to take a multi-dimensional approach that addresses multiple components of an individual's lifestyle.

In addition, patient education also plays a key role in strengthening these non-clinical intervention strategies. Self-management education enables individuals to learn how to best manage their diabetes in order to optimize metabolic control while simultaneously enhancing quality of life by guarding against acute and chronic complications at manageable costs. (11) By embracing healthy practices daily with modifications like increased physical activity levels, proper portion sizing choices coupled with holistic approaches like weight loss; people living with diabetes can achieve glycated hemoglobin (HbA1c) level targets below or equal 7% which goes a long way toward mitigating microvascular-related impediment towards cardiovascular diseases arise from unfavorable numbers regarding lipid profile. (12) Therefore strategies on the management of diabetes, interventions that target the system of chronic disease management along with patient self-management may lead to improved outcomes for diabetes mellitus. (13) Hence the present study is "The magnitude of Diabetes mellitus with different interventions" framed and carried out with the following aim and objectives. The aim of present study is to examine the complications of Diabetes in the population, additionally the study also conduct a scientific validation on magnitude of Diabetes mellitus with different interventions.

MATERIALS AND METHODS

Research Design

The research design selected for this study "The magnitude of Diabetes mellitus with different interventions" is a quasi-experimental design,

in Krishna district Andhra Pradesh, India “is presented under the following headings. Specifically, a non-equivalent control group design. This design allows for a comparison between the experimental and control groups, where the experimental group receives multiple interventions while the control group receives only dietary management.

Definition For The Current Study

The "Enormity of Type 2 Diabetes Mellitus with Multiple Approaches" research intends to assess the impact of various interventions on the severity of diabetes mellitus in a given location or healthcare facility in India. The research evaluates the efficacy of a multi-faceted intervention approach that includes management of nutrition, changes in lifestyle, and caretaker education for a group of control subjects that simply obtain dietary guidance. The study's primary objective is to figure out the incidence of type 2 diabetes in the population being studied and the efficiency of therapies for controlling this disease. This research aims to gain insight into essential diabetes indicators like glycemic control (e.g., HbA1c levels), adherence to modifications to diet and lifestyle, and comprehensive management of diabetes outcomes.

Selection of Area

The present study was carried out in Vijayawada Krishna District, Andhra Pradesh. Vijayawada is the primary hub for health care in Andhra Pradesh. People from surrounding villages and districts visit Vijayawada for better medical help. A survey report from the Union Health Ministry states that two third of cases of diabetes are present in the Krishna district. According to health experts, it was observed the trend of rising Diabetes cases especially in the age group of 18 to 40 years in Vijayawada. The prevalence was around 15% in Vijayawada.

Selection And Size Of The Sample

The target population for the present study was the individuals visiting the Outpatient department of the diabetes hospital. A total of 250 respondents, were included in the study. The primary objectives of this research were to evaluate the severity of type 2 diabetes in the target group and determine how well therapies have succeeded in managing it. Parameters of glycemic management (such as HbA1c levels), compliance with changes in diet and lifestyle, and the overall outcome of managing diabetes represent a few of the significant diabetes-related parameters that will be examined in this study. The study was conducted during June 2022 to December 2022. The study compares the group participating in the experiment, which was given the comprehensive interventions, with the control group, which just received dietary management, using a kind of quasi-experimental strategy, particularly a control group that is not equivalent in design. A convenience sample will be used to choose a total of 250 participants, guaranteeing that different demographics and levels of diabetes severity are represented. The target population for this study will be individuals diagnosed with diabetes mellitus in a specific region or healthcare facility in India. A total of 250 participants will be recruited. Convenience sampling technique was used to recruit the participants from the target population based on their willingness to participate, and availability. However, it was ensured the sample represents the diversity of the population, factors such as age, gender, socioeconomic status, and onset of diabetes and severity.

Research Design and Model



Figure 1; The figure demonstrates the research model used in the present study. Here in the study, Patients with Diabetes mellitus were grouped into two classes one experimental (n=150) and second control (n=100).

Data Analysis

Descriptive statistics: descriptive statistics were used to summarise the demographic information and baseline measures. Inferential data analysis was utilized to compare the results between the control and experimental groups and investigate the effects of the interventions on managing diabetes factors. Subgroup analysis: Subgroup analyses were performed based on factors such as age, gender, or diabetes severity to explore potential variations in intervention effectiveness.

RESULTS AND DISCUSSION

The present study was carried out in Vijayawada Krishna District, Andhra Pradesh, India. Vijayawada is the primary hub for health care in Andhra Pradesh and well educated city. The aim of present study is to examine the complications of Diabetes in the population, additionally the study also conduct a scientific validation on magnitude of Diabetes mellitus with different interventions. The target population for the present study was the individuals visiting the Outpatient department of the diabetes hospital. A total of 250 respondents, were included in the study. The primary objectives of this research were to evaluate the severity of type 2 diabetes in the target group and determine how well therapies have succeeded in managing it. Parameters of glycemic management (such as HbA1c levels), compliance with changes in diet and lifestyle, and the overall outcome of managing diabetes represent a few of the significant diabetes-related parameters that will be examined in this study. The study was conducted during June 2022 to December 2022. The study compares the group participating in the experiments, which were given the comprehensive interventions, with the control group, which just received dietary management, using a kind of quasi-experimental strategy, particularly a control group that is not equivalent in design. In the present study participants enrolled for the survey are summarized in the table given below. As the data showed figure 2, female participation was much higher than the male participants. Here, out of 250 enrolled participants female represents 62% (155/250) while male 38% (95/250). As the data showed, part time employed participants represent 56.4% while full time were 22%. Additionally, 17.2% were self-employed participants with others 4.4%. The occupation is key criteria that not only influence the understanding diabetes but also options available to mitigate. As the data showed, the key challenges faced by the enrolled participants in the present study for the management of Diabetes mellitus are limited availability of health professionals (30%), lack of healthcare facility in the area (28%), and lack of transportation (13.2%). Additionally, financial constraints (12.4%) and unavailability/lack of awareness/education (6.8%) is other key barrier in the management of diabetes mellitus. As the data showed in the figure 2a, more than 60% enrolled participants never receive any education or booklet information regarding diabetes management. On other hand, only 39.2% enrolled participants received educational information in the form of booklets for the diabetes mellitus management. As the result showed in the figure 2b, a large percentage of enrolled participants never receive any educational information regarding diabetes mellitus management. This could be one reason for delayed and failed diabetes mellitus management in the population.

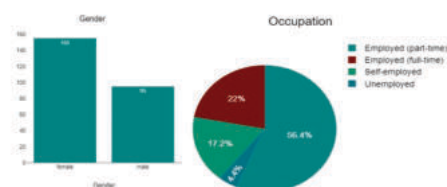
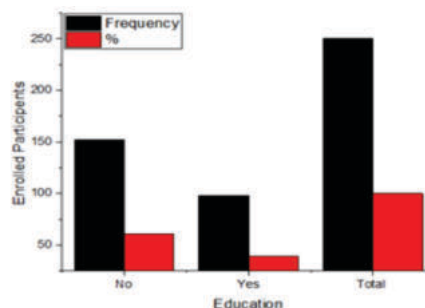


Figure 2; Gender wise participation in the survey (a) and their occupation (b).



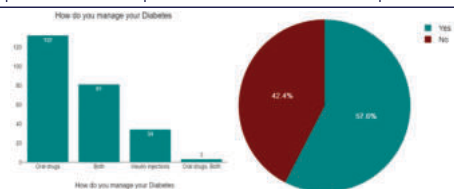


Figure 5: Approach for diabetes management (a) and outcome of diabetes management (b).

As the data showed in the table 4.13, 56.4% (141/250) enrolled participants have idea of blood glucose monitoring devices and uses in order to manage the diabetes mellitus. Other 43.6% (109/250) enrolled participants neither have any idea nor use self monitoring blood glucose. These finding clearly demonstrates that the nearly 50% of enrolled participants do not have any idea of diabetes mellitus management. As the results showed 44.8% (112/250) consume sugary beverage once in a week while other 26% (65/250) several times in a week. Enrolled participants who consume sugary beverage on regular basis i.e., daily account 6% (15/250) while only 23.6% never or rarely consume sugary beverages. As the data showed, 43.6% (109/250) enrolled participants consume once in a week while 26% (65/250) enrolled participants consume fruits and vegetables on daily basis. Enrolled participants also showed responses that 23.6% rarely or never consumes fruits and vegetables. Also in the survey 6.8% (17/250) enrolled participants consumes fruits and vegetables several times in a week. Here, 29.6% (74/250) enrolled participants showed renal disorders (kidney complications) associated with the diabetes mellitus. Second and most common co-morbidity condition associated with diabetes was reported obesity ie 28.4% (71/250). As the data showed, 57.2% (143/250) enrolled participants aware of fruits role in maintenance of the normal blood sugar level. While other 42.8% (107/250) enrolled participants are not aware of role of fruits regulating in the blood sugar level.

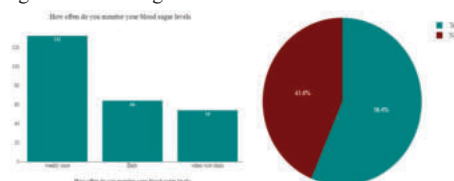


Figure 6; Participant approach in diabetes management first via diagnosis (a) and outcome.

A pie chart showing the frequency of use of the 100 most common verbs. The chart is divided into 20 segments, with the largest segment being '3' at 32.4%.

Frequency	Percentage
3	32.4%
4	10.0%
5	9.2%
2	7.2%
6	7.2%
Monthly once	6.4%
7	5.6%
8	5.6%
Very rare	4.8%
Regular	4.8%
Rarely	4.8%
3	4.8%
Once in 3 months	4.8%
Once in 3 months	4.8%
Sometimes	4.8%
Twice in a month	4.8%
Thrice in a month	4.8%
4	4.8%
5	4.8%
6	4.8%
7	4.8%
8	4.8%
9	4.8%
10	4.8%
11	4.8%
12	4.8%
13	4.8%
14	4.8%
15	4.8%
16	4.8%
17	4.8%
18	4.8%
19	4.8%
20	4.8%

As the data showed, 54.8% (137/250) consume refined food while 24.8% prefer to have whole grains as part of diet. Additionally, 20.4% enrolled participants consume both i.e. refined and whole grain as part of diet (Figure 4.15). As the data showed, 62.4% (156/250) enrolled participants do have family history of diabetes mellitus while other 37.6% donot. These finding cleary states that the clinical intervention do requir as examination of family hisotry of case. In India and other part of word mainly low income keeping family medical records and histry is poorly considered that affects management of not only diabetes mellitus but other disease as well (14). As the data showed, 72% (180/250) are aware of balance diet while other 28% (70/250) are not aware of importance of balance diet and its impact on diabetes mellitus. As the data showed in the table 4.21, enrolled participants showed mixed responses. Here in the present survey, 32.4% (81/250) prefer to go for test 3 times in a year, 10.80% (27/250) opt four times in

a year. Other enrolled participants 9.2% (23/250) prefer to go for test four times in a year while 7.2% (18/250) enrolled participants five times and six times in a year. Enrolled participants also showed a mixed response towards the routine test as showed patients opt test for diabetes diagnosis as per need, ones in a month, when feel sick and or when physician recommend.

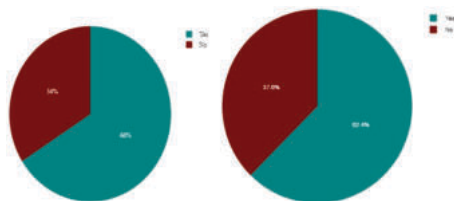


Figure 8; The participant family support at home (a) and at clinic (b).

As the data showed, 66% (165/250) showed attended self management education programs. On the contrary, 34% (85/250) enrolled participants never attended any program, self management education program. Any sessions of self management education program provide most recent clinically approved diet plans, therapeutic interventions and others programs to mitigate diabetes mellitus. Diabetes is a chronic illness for which people are responsible for 95% of their own care. (14) Patient empowerment and efficient diabetes education can help people manage their illness and develop the self-care habits required for excellent diabetes self-management. (15) To sustain effective diabetes self-management and prevent or delay diabetic complications, the patient must feel that they have this degree of control. (16) As the data showed, 62.4% (156/250) enrolled participants showed that they received support for diabetes management. On the contrary, 37.6% (94/250) did not receive any support (education, diagnosis and therapeutics) for the diabetes mellitus management. These findings clearly states that the enrolled participants who do not receive any kind of support may face difficulty in the management of diabetes mellitus. Effective diabetic self-management, though frequently complex and challenging to acquire, can avert long-term health consequences. (17) Better diabetes self-care and glycemic control are a result of health care professionals' support for patients' autonomy (autonomy support) in controlling their diabetes. However, managing the condition and its consequences is less effective than using cost-efficient and ongoing clinical treatment, preventative measures, and person-centered goal development and its implementation to reach the desired diabetes management goals. (18)

As the data showed, 57.2% (143/250) enrolled participants did received psychological support. On the other hand 42.8% (107/250) do not receive any psychological support at all. One of the most crucial aspects of the treatment of patients with type 2 diabetes, particularly in susceptible populations like teenagers and young adults, may be psychological support. Young patients are frequently subjected to severe pressure, high expectations, and unique diabetes-related limits that have a negative impact on their welfare and behavior, leading to low self-esteem, mood swings, despair, or even eating disorders. (19) In order to effectively function and manage the disease, it may be necessary to take a more comprehensive approach to treating diabetes and to providing for psychological support. (20) Differentiating some treatment approaches, like the positive approach (PA) described in the text, may aid young patients in maintaining motivation, managing their condition, and accepting the restrictions brought on by type 2 diabetes. (21) As the data showed in the table 4.29, 57.6% (144/250) enrolled participants experience hypoglycemia episodes sometimes. Further, 24.8% (62/250) enrolled participants experience hypoglycemia episodes rarely or never. Additionally, 17.6% (44/250) enrolled participants experience hypoglycemic episodes very frequency. The primary risk factors for severe hypoglycemia include impairments in counter regulatory responses and hypoglycemia unawareness. Physical and mental illness are linked to episodes of hypoglycemia. A barrier preventing the patient from achieving effective glycemic control is their fear of hypoglycemia. (22) Patient education about risk factors, early diagnosis, and treatment of hypoglycemia, as well as the establishment of individualized glycemic control objectives, must be prioritized in order to prevent hypoglycemia. (23)

CONCLUSION

Diabetes mellitus a complex metabolic disorder defined by hyperglycemia brought on by deficiencies in insulin secretion, action, or both. Globally and in emerging nations like India, the burden of

diabetes is large and rising, primarily due to rising rates of overweight/obesity and unhealthy lifestyles. In India, 77 million people were estimated to have diabetes in 2019, and by 2045, that number is projected to reach over 134 million. The aim of present study is to examine the complications of Diabetes in the population, additionally the study also conduct a scientific validation on magnitude of Diabetes mellitus with different interventions. Here, out of 250 enrolled participants female represents 62% (155/250) while male 38% (95/250). The findings demonstrate a comparison between the enrolled participants for the present survey. The occupation is key criteria that not only influence the understanding diabetes but also options available to mitigate. Present study, enrolled participants were asked to provide their response for the education regarding diabetes; book information regarding diabetes management. More than 60% enrolled participants never receive any education or booklet information regarding diabetes management. The results showed 52.40% (131/250) enrolled participants possess elementary knowledge of diabetes. Further, 28.80% (62/250) enrolled participants possess adequate information on diabetes while other 22.8% (57/250) lack any information on regarding diabetes mellitus. These finding clearly demonstrates a large percentage of enrolled participants either lack education or awareness on diabetes or elementary knowledge. The result showed 57.2% (143/250), enrolled participants faces moderate stress while diabetes mellitus. While 28% (70/250) enrolled participants are associated with low level of stress. On the contrary, 14.8% (37/250) enrolled participants reported with high level of stress. The result showed, 64.8% (162/250) enrolled participants experience diabetes related burnout (e.g., feeling overwhelmed, or exhausted). On the contrary, 35.2% (88/250) enrolled participants do not experience any such symptoms (e.g., feeling overwhelmed, or exhausted). Here nearly 57.2% (143/250) enrolled participants did received psychological support. On the other hand 42.8% (107/250) do not receive any psychological support at all (Figure 4.24). One of the most crucial aspects of the treatment of patients with type 2 diabetes, particularly in susceptible populations like teenagers and young adults, may be psychological support. The result showed here 62.8% (157/250) enrolled participants showed that their family member accompanied during the counseling sessions while 2% (93/250) showed that their family member never accompanied during counseling session. The findings showed 61.2% (153/250) reported hypoglycemia episodes while other 38.8% (97/250) never experience such pathophysiological state. Diabetes patients frequently experience hypoglycemia, especially those on glinide, sulfonylurea, or insulin.

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Conflict of Interest: Author declares no conflict of interest.

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