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An In-Depth Analysis of Anti-Diabetic Medication Prescribing Patterns, Utilization Trends, and Patient Compliance: A Cross-Sectional Study at Santosh Medical College and Hospital, Delhi NCR

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Abstract
This cross-sectional study conducted at Santosh Medical College and Hospital in Ghaziabad, Delhi NCR, delves into the prescribing patterns, utilization trends, and patient compliance regarding anti-diabetic medications. With a focus on outpatients, the research utilizes WHO Drug Prescribing Indicators and Morisky's Medication Adherence Scale for comprehensive analysis. The demographic distribution reveals a concentration of diabetic patients in the 31 to 60 age group, emphasizing the need for targeted interventions in this productive age range. Predominant prescription of Biguanides and Sulfonylureas aligns with global guidelines, while limited use of newer drug classes prompts exploration into potential barriers. Polytherapy prevalence underscores the multifaceted nature of diabetes management. Noteworthy adherence to WHO essential drugs, generic names, and fixed-dose combinations reflects commitment to evidence-based and cost-effective practices. Morisky's scale reveals positive compliance behaviors, with education level, diabetes duration, HbA1c levels, comorbidities, and knowledge influencing adherence. The study's implications include targeted interventions for improved compliance, highlighting the intricate relationship between patient demographics, prescription practices, and medication adherence. Comparative analysis with existing literature enhances the study's generalizability, while future research opportunities aim to explore additional variables and socio-economic influences for refined strategies in diabetic patient care. The comprehensive insights provided can guide healthcare practitioners, policymakers, and researchers in optimizing diabetes management practices, fostering continuous improvement in patient outcomes and healthcare practices.

Keywords: Diabetes Mellitus, Drug Utilization Patterns, Patient Compliance, WHO Drug Prescribing Indicators, Morisky's Medication Adherence Scale, Cross-Sectional Study, Santosh Medical College and Hospital, Delhi NCR.

I. INTRODUCTION

The global healthcare landscape grapples with the substantial challenge presented by Diabetes Mellitus (DM), necessitating a comprehensive exploration of prescribing patterns, drug utilization trends, and patient compliance. This imperative has led to the initiation of research endeavors aimed at systematically investigating these critical aspects. The focus of this study is on outpatients receiving care at Santosh Medical College and Hospital in Ghaziabad, situated in the Delhi National Capital Region (NCR). By delving into the intricate details of anti-diabetic medication practices, this research seeks to contribute valuable insights to the broader discourse on diabetes management and healthcare optimization.

The principal aim of this investigation is to analyze drug utilization patterns utilizing the WHO Drug Prescribing Indicators and to assess patient compliance with anti-diabetic medications. Employing a cross-sectional design, the study relies on the integration of electronic health records and patient interviews as robust methods for comprehensive data collection. Through these methodologies, the research aims to provide a nuanced understanding of prescribing practices and patient adherence, thereby contributing to the enhancement of diabetes care strategies.

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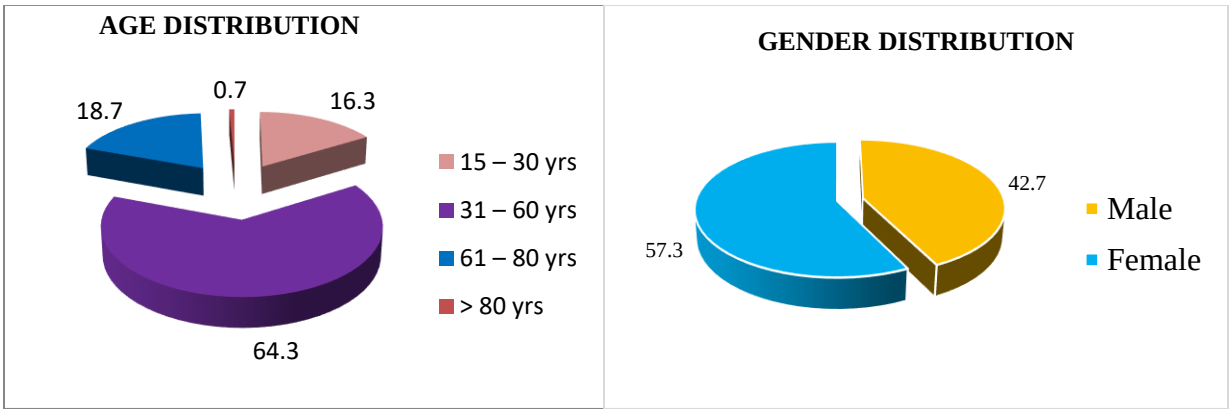
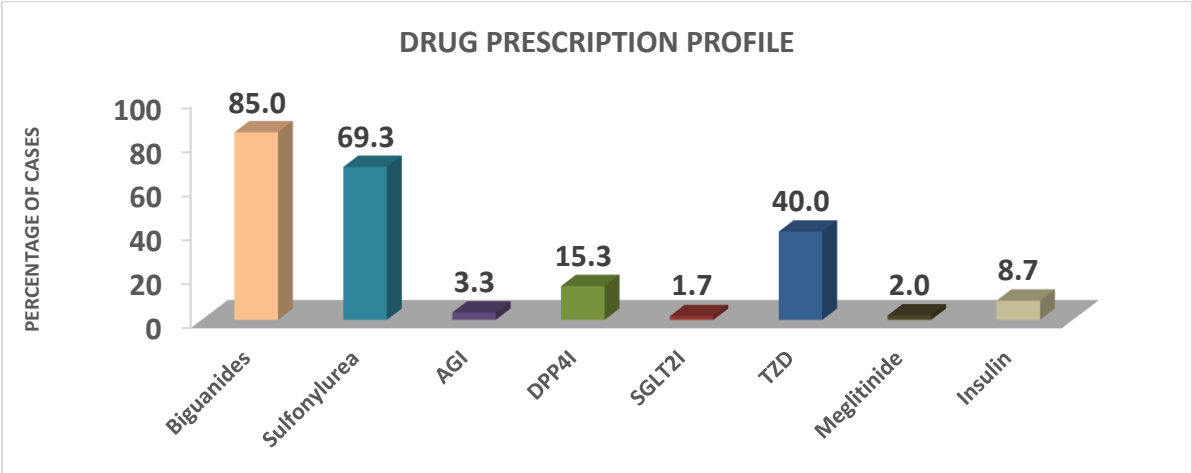
Data for this study were meticulously gathered from prescriptions and patient interviews to facilitate an in-depth analysis of drug utilization patterns. The research employed a comprehensive approach utilizing descriptive and inferential statistics, as well as qualitative thematic analysis, to ensure a thorough understanding of the prescribing landscape. To evaluate patient compliance, a multi-faceted approach was adopted, including the application of Morisky's Medication Adherence Scale, rigorous adherence to clinical criteria, and meticulous cross-checking procedures. The combination of these methodological strategies aimed to provide a robust foundation for the exploration of prescribing practices and patient adherence in the context of anti-diabetic medications. The integration of these methods enhances the reliability and validity of the findings, contributing to the credibility of the research outcomes.

Preliminary findings elucidate critical aspects of anti-diabetic medication management among outpatients at Santosh Medical College and Hospital. The examination encompasses various dimensions, including the total number of prescribed drugs, average drugs per prescription, monotherapy and polytherapy prevalence, adherence to the WHO Essential Drug List, utilization of generic names, fixed-dose combinations, and administration routes.

Demographic Data Analysis: An in-depth scrutiny of the age distribution among diabetic outpatients demonstrates a notable concentration in the productive age group of 31 to 60 years, constituting 64.3% of cases. This concentration implies a potentially higher prevalence of diabetes in the middle-aged population, influenced by lifestyle factors and genetic predispositions. The average age of diabetic patients was calculated at 48.92 years, emphasizing the importance of tailoring diabetes management strategies to meet the unique needs of individuals within this age range. The gender distribution indicates a nearly equal representation between males (42.7%) and females (57.3%), emphasizing the significance of considering diverse factors in disease manifestation and management.



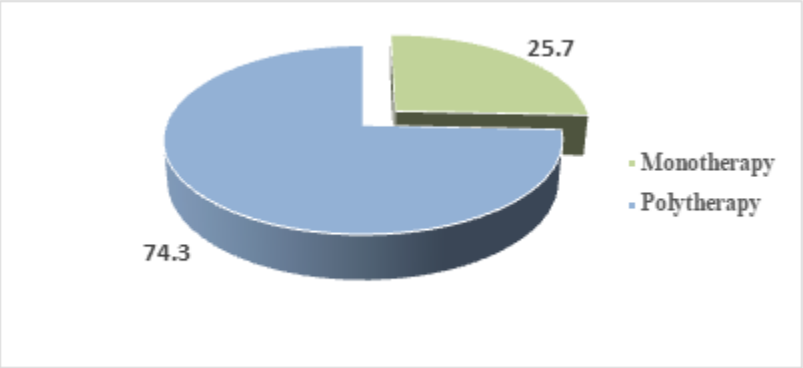
Drug Prescription Profile: An exploration of the drug prescription profile reveals noteworthy trends. Biguanides (Metformin) and Sulfonylureas were prevalent, prescribed in 85.0% and 69.3% of cases, respectively, aligning with global guidelines recommending them as first-line treatments for diabetes. However, there is limited adoption of newer drug classes like DPP4 Inhibitors (DPP4I) and SGLT2 Inhibitors (SGLT2I), indicating potential barriers such as cost or accessibility. Thiazolidinediones (TZD) were prominently prescribed in 40.0% of cases, suggesting significant consideration for patients with insulin resistance or intolerance to other oral agents. Overall, the observed prescription pattern aligns with established guidelines, emphasizing the efficacy and safety of well-established drug classes.



Monotherapy & Polytherapy Prescriptions: Polytherapy emerges as a prevalent approach, indicating the complexities involved in managing diabetes within the outpatient setting. Notably, monotherapy, particularly with Biguanides (85.0%) and Sulfonylureas (69.3%), suggests that a significant number of patients initially receive a single medication for diabetes management. The prevalence of polytherapy underscores the progressive nature of diabetes, necessitating a comprehensive treatment approach over time. Understanding the reasons behind the choice of monotherapy or polytherapy contributes to a profound comprehension of the evolving strategies employed by healthcare providers in managing diabetes.

Drug class	**Frequency (N = 300)**	**Percentage (%)**
Biguanides	255	85.0
Sulfonylurea	208	69.3
AGI	010	03.3
DPP4I	046	15.3
SGLT2I	005	01.7
TZD	120	40.0
Meglitinide	006	02.0
Insulin	026	08.7

Antidiabetic Drugs in Monotherapy & Polytherapy: A detailed analysis of drug classes in both monotherapy and polytherapy highlights the dominance of Biguanides and Sulfonylureas. Insulin's relatively low usage in monotherapy (5.2%) suggests a conservative approach, typically reserved for cases where oral agents alone prove insufficient. The distribution of classes in both settings reflects a balanced approach, with consistent use of Biguanides and Sulfonylureas. The prevalence of polytherapy in diabetes management underscores the complex nature of the disease and the necessity for a multifaceted approach.



Profile of Indicators: The average number of drugs per prescription, calculated at 2.94 ± 1.56, signifies a moderate level of polypharmacy. Notably, the exclusive use of WHO essential drugs and generic names (100.0%) reflects a commitment to evidence-based and cost-effective prescribing practices. The prevalence of fixed-dose combinations stands at 66.6%, indicating a streamlined approach to simplify medication regimens. Oral preparations constitute the majority of prescriptions (91.3%), emphasizing convenience and patient preference for oral medications.

Indicators	**Values**
Average no. of drugs per prescription	2.94 ± 1.56
% of WHO essential drugs	
% of drug prescribed by Generic name	100.0%
% of drug prescribed by Fixed dose combination	66.6%
% of drug prescribed by parental prep	08.7%
% of drug prescribed by oral prep	91.3%

Medication Adherence in Diabetic Patients: The detailed analysis provides valuable insights into various factors influencing compliance with anti-diabetic drugs. General observations highlight a significant proportion of respondents exhibiting positive medication compliance behaviors. Trends include consistent adherence to medication schedules, avoidance of discontinuation when feeling better, and adherence to prescribed doses. Financial constraints do not emerge as a significant barrier to compliance for most respondents.

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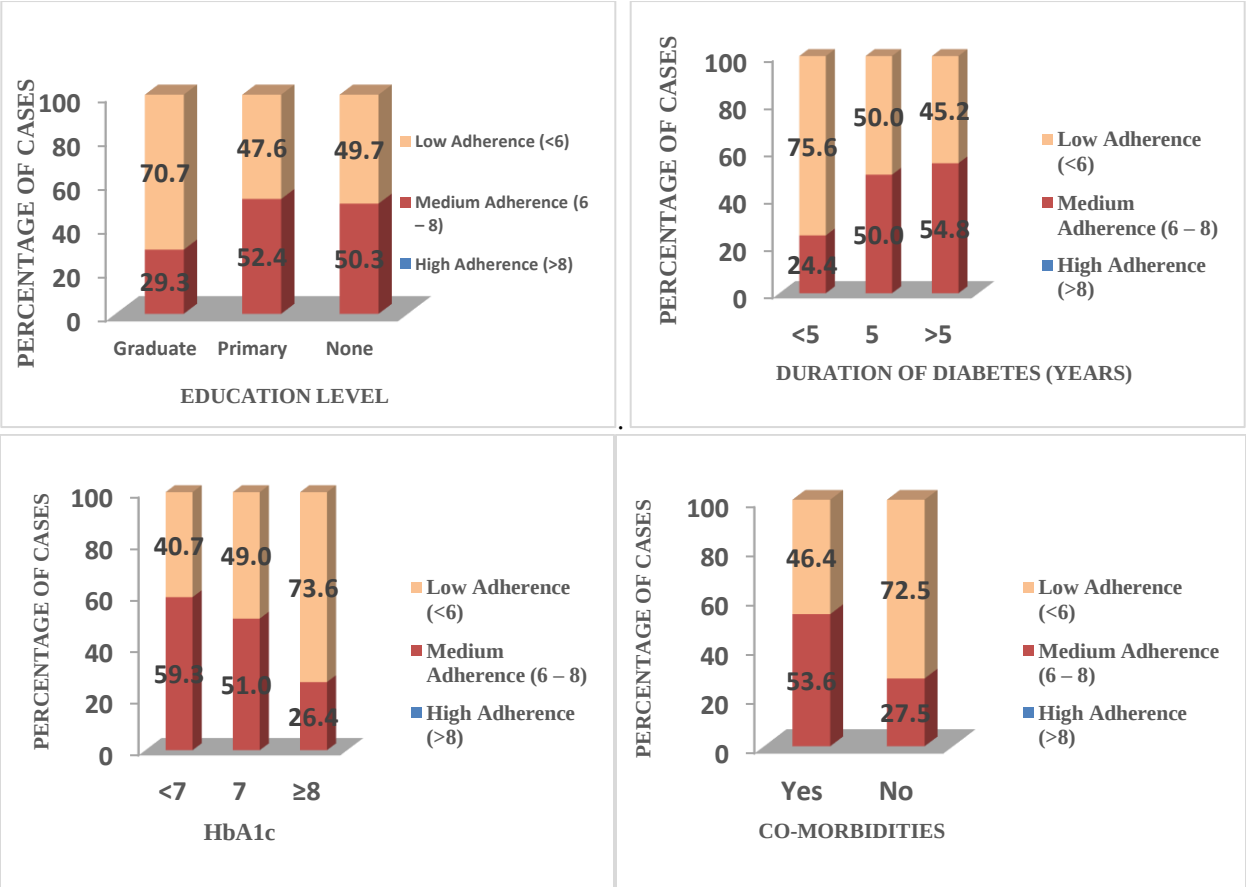
II. ANALYSIS OF FACTORS INFLUENCING MEDICATION ADHERENCE:

Age: Potential challenges in compliance are observed in age groups 10–30 and 61–80 years, with varied compliance levels in the 31–60 age group. Gender: No statistically significant differences observed between genders. Marital Status: No statistically significant differences observed based on marital status. Education Level: Graduate respondents show a higher proportion of low compliance, while primary and none education levels exhibit varied compliance levels. Regression analysis indicates a potential relationship, requiring further exploration. Occupation: No statistically significant differences observed based on occupation. Smoking: No statistically significant differences observed based on smoking status. Alcohol Status: No statistically significant differences observed based on alcohol status. Diabetic Diet: No statistically significant differences observed based on adherence to a diabetic diet. Physical Exercise: No statistically significant differences observed based on physical exercise. Family History of DM2: No statistically significant differences observed based on family history. Duration of Diabetes: The duration of diabetes shows a statistically significant association with MMAS Score, with a longer duration associated with higher MMAS Scores. HbA1c: HbA1c levels show a statistically significant association with MMAS Score, with higher HbA1c associated with lower MMAS Scores. Comorbidities: The presence of comorbidities shows a statistically significant association with MMAS Score, with the presence of comorbidities associated with higher MMAS Scores. Knowledge of Complications of DM2: Knowledge of complications of DM2 shows a statistically significant association with MMAS Score, with higher knowledge associated with higher MMAS Scores.



The analysis offers valuable insights into potential areas for targeted interventions to improve medication compliance in diabetic patients. The association of duration of diabetes, HbA1c levels, comorbidities, and knowledge of complications with medication compliance underscores the need for holistic healthcare approaches. Further research and exploration are warranted to understand the complex interplay of various factors influencing medication compliance in diabetic individuals, facilitating continuous improvement in patient outcomes and healthcare practices.

This research delves into the intricate interplay of demographic and clinical variables on drug utilization and compliance in the outpatient management of diabetes at Santosh Medical College and Hospital. While acknowledging the inherent challenges and advantages of a single-hospital setting, cross-sectional design, and reliance on self-reported compliance, the study illuminates key implications for diabetes management and identifies avenues for potential interventions.

Demographic Analysis: The demographic analysis underscores critical insights into the patient population seeking diabetes management at Santosh Medical College and Hospital. The concentration of diabetic patients in the 31 to 60 age bracket aligns with global trends, emphasizing the significance of targeted interventions and preventive strategies tailored to the productive age group. The near-equal gender distribution challenges preconceived gender biases in diabetes, highlighting the need to consider diverse factors in disease manifestation and management. These demographic revelations not only enrich the specific context of diabetes care at Santosh but also contribute to the broader understanding of global patterns, augmenting the external validity of the study's findings.

Prescription Patterns: The examination of prescription patterns reveals a consistent prevalence of Biguanides and Sulfonylureas, aligning with established global recommendations for first-line diabetes treatment. However, the lower adoption rates of newer drug classes, such as SGLT2 inhibitors and DPP4 inhibitors, raise concerns and prompt a call for in-depth exploration into the barriers hindering their integration into the treatment regimen. The significant prescription of Thiazolidinediones (TZD) in 40% of cases signals specific considerations for patients with insulin resistance, necessitating further investigation into the rationale behind this prescribing pattern.

Polytherapy: The high prevalence of polytherapy, observed in 74.3% of prescriptions, sheds light on the multifaceted nature of diabetes management. While polytherapy is acknowledged as a necessary approach in many cases, the associated challenges of polypharmacy, evidenced by an average of 2.94 drugs per prescription, prompt considerations regarding the potential burden on patients, compliance challenges, and the essentiality of each prescribed medication. The unwavering commitment to using WHO essential drugs and generic names in polytherapy prescriptions reflects a commendable dedication to evidence-based and cost-effective prescribing practices.

Medication Compliance: The assessment of medication compliance, gauged through Morisky's Medication Compliance Scale (MMAS), reveals positive compliance behaviors among the majority of respondents. However, the emergence of concerns about side effects as a notable factor influencing compliance calls for nuanced strategies to address medication-related apprehensions. The regression analysis provides valuable insights into the factors influencing compliance, with variables such as education level, duration of diabetes, HbA1c levels, comorbidities, and knowledge of complications exhibiting statistical significance.

Comparison with Previous Studies: A comparative analysis with previous studies elucidates both consistencies and divergences in findings. The alignment of demographic trends, prescription patterns, medication compliance, and factors influencing compliance with established literature enhances the robustness and generalizability of the study's findings. However, the prominence of Thiazolidinediones (TZD) and variations in polypharmacy levels contribute novel perspectives, emphasizing the need for region-specific considerations and accounting for unique patient characteristics in diabetes management.

Overall, the study's findings provide a comprehensive understanding of outpatient diabetes management at Santosh Medical College and Hospital. The insights into demographic patterns, prescription practices, polytherapy prevalence, and medication compliance contribute substantively to the ongoing discourse on optimizing diabetes care. The study serves as a catalyst for further research to explore regional variations and specific patient characteristics, fostering continuous improvement in patient outcomes and refining healthcare practices. The synthesis of knowledge from multiple studies enriches the relevance and applicability of the study's outcomes to clinical practice, thereby contributing to the evolving landscape of diabetes care.

This study provides valuable insights into anti-diabetic drug utilization patterns and patient compliance, thereby contributing to evidence-based diabetes care. The findings have implications for healthcare practitioners, policymakers, and researchers, guiding concerted efforts towards improving prescribing practices and enhancing patient adherence in diabetes management. The research aimed to comprehensively evaluate prescription patterns, drug utilization, and compliance of anti-diabetic drugs in diabetic outpatients at Santosh Medical College and Hospital in Ghaziabad, Delhi NCR.

Demographic insights revealed that the majority of patients (64.3%) belonged to the 31 to 60 age group, suggesting a potential higher prevalence of diabetes in middle-aged individuals, with an almost equal gender distribution. This demographic foundation serves as a crucial platform for tailoring intervention strategies to address the unique needs of different patient groups, emphasizing the importance of personalized and context-specific approaches in diabetes care.

Analysis of prescription patterns highlighted a significant prevalence of Biguanides and Sulfonylureas, aligning with established global recommendations for first-line diabetes treatment. However, the underutilization of newer classes like SGLT2 inhibitors and DPP4 inhibitors raises concerns and emphasizes the need for further exploration into the barriers hindering their adoption. The notable prominence of Thiazolidinediones (TZD) in 40% of cases suggests specific considerations for patients with insulin resistance or intolerance, signaling the complexity of therapeutic decision-making.

Polytherapy prescriptions were prevalent (74.3%), reflecting the intricate nature of diabetes management. The average number of drugs per prescription (2.94 ± 1.56) indicated a moderate level of polypharmacy, prompting considerations about patient burden and compliance

challenges. The consistent use of WHO essential drugs, generic names, and fixed-dose combinations underscored a commitment to evidence-based and cost-effective prescribing practices, reflecting a patient-centric approach to diabetes care.

The compliance assessment using Morisky's Medication Compliance Scale (MMAS) revealed significant associations between various factors and compliance. Higher education correlated with better medication compliance, emphasizing the positive relationship between education and compliance in chronic diseases like diabetes. Longer diabetes duration correlated with decreased compliance, highlighting the challenges associated with long-term management. Better compliance correlated with improved glycemic control, underlining the critical relationship between compliance and optimal outcomes. Compliance varied among patients with comorbidities, emphasizing the complexity introduced by additional health conditions. Furthermore, better awareness of diabetes complications correlated with higher compliance, emphasizing the pivotal role of patient education in fostering adherence.

III. IN CONCLUSION

the comprehensive analysis of drug utilization patterns in diabetic outpatient management provides profound insights into current prescribing practices. The observed trends underscore the imperative for a patient-centric, evidence-based approach to diabetes care, considering demographic factors, prescription patterns, and therapeutic choices. Addressing factors influencing medication compliance is paramount for healthcare providers in tertiary care teaching hospitals. Targeted interventions, personalized education strategies, and a nuanced approach to compliance can significantly improve patient outcomes, reduce complications, and enhance the overall quality of life for individuals with diabetes.

Future research opportunities include delving deeper into additional variables, socio-economic influences, and the effectiveness of specific interventions to refine strategies for enhancing compliance in diabetic patients. The commitment to ongoing evaluation ensures adaptability to the evolving needs of diabetic patients in a dynamic healthcare landscape. The study sets the stage for continuous improvement in diabetes management practices, emphasizing the importance of a holistic and patient-centered approach in optimizing outcomes for individuals living with diabetes.

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