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Original Research Article

Antihypertensive prescribing patterns in type 2 diabetes patients with hypertension: a cross-sectional study

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ABSTRACT

Background: The combination of type 2 diabetes mellitus (T2DM) and hypertension is associated with an increased risk for cardiovascular, renal and metabolic complications. Guidelines such as JNC 8, ADA, NICE advocate ACEIs, ARBs, CCBs and thiazide diuretics to be first-line antihypertensive drugs for diabetic patients based on evidence. Nevertheless, prescribing habits still differ among low-resource areas, one of which is Bangladesh. Objectives were to assess the prescribing pattern of antihypertensive drugs in hypertensive T2DM patients who come for treatment to tertiary hospitals in Bangladesh and also to evaluate the level of adherence with the international guideline-recommended therapies.

Methods: A cross-sectional study was carried out from August 2021 to July 2022 in a total of 246 hypertensive T2DM patients who received treatment in the OPDs of Sir Salimullah medical college and Mitford hospital (SSMCH) and BIRDEM. Data was obtained with the help of pretested questionnaire and analyzed through SPSS version 23.

Results: The average age of participants were 59.5±10.5 years, and 56% were women. Overweight and obesity were more than common (75.8% and 12.1%, respectively). Comorbidities were prevalent including chronic kidney disease (CKD) (37.6%), dyslipidaemia (33.1%) and ischemic heart disease (29.3%). The classes of β-blockers (23.2%) were the most commonly used, followed by ARBs (20.8%), CCBs (17.4%), diuretics (12.4%) and ACEI (9.7%). 42.4% of patients received combination therapy.

Conclusions: Prescriptions were characterized by inadequate compliance to established international standard with high rate of prescription of the non-guideline-favored beta blockers over ACEIs, ARBs and thiazide diuretics. Promotion of evidence-based prescriptive practices is required to optimize cardiovascular and renal outcomes in diabetic hypertensives in Bangladesh.

Keywords: Antihypertensive medications, Type 2 diabetes mellitus, Hypertension, Prescribing patterns, Evidence-based guidelines

INTRODUCTION

Type 2 diabetes mellitus (T2DM) and hypertension are commonly interrelated and considered as two of the most serious global public health problems in light of their synergistic effects on cardiovascular and renal morbidity. Epidemiological studies have demonstrated that about 80% of T2DM patients would eventually develop hypertension evidenced in the case of inter-related pathophysiology, which involves insulin resistance,

endothelial dysfunction, sympathetic overactivity and renal sodium retention.[1] The global burden of NCDs is also increasing, and according to international diabetes federation (IDF), there were 537 million adults with diabetes in 2021, and the number is expected to rise up to reach 643 million by 2030.[2] Likewise, hypertension affects more than 1.28 adult billion globally and is worse in low- and middle-income countries (LMIC) where the rates of detection, treatment and control are poor.[3]

Concomitant with T2DM, the presence of hypertension significantly raises the risk for a variety of negative outcomes such as coronary vessel disease, CKD, stroke, retinopathy and premature death. Patients with both conditions seem to have about a twofold risk of cardiovascular events as compared with non-diabetic hypertensive patients.[4] Therefore, the ideal control of blood pressure in T2DM individuals is an important practice in clinical management. There is ample evidence that antihypertensive treatment produces major reductions not only in microvascular, but also in macrovascular complications and can be more beneficial clinically sooner than with intensive glycaemic control alone.

JNC 8, ADA, ACC/AHA, and NICE advise that ACEIs/ARBs, CCBs nervous system immaturity, mechanical ventilation, or G-meanages are well known for their protective effects against GI-OPD in combined therapy with a thiazide-type diuretic or a CCB as the initial treatment of individuals who are hypertensive and have diabetes. These suggestions are evidenced by data showing each to be effective in diminishing the risk of cardiovascular events and slowing renal disease progression. However, guideline recommended practices are sometimes not implemented in actual practice which varies from prescribing patterns because prescribers' preferences and patient's financial status, have significant influence on the decision-making process in a developing country.[5]

Bangladesh, with a fast-rising trend of T2DM and hypertension, epitomizes these challenges. Based on the national surveys, 13.1% of adults have diabetes and an overall estimated of hypertension prevalence is around 21%, with low awareness and poor treatment adherence.[6] Knowledge of antihypertensive prescribing patterns in the Bangladeshi diabetic community is also important as prescription of therapies not adhering to evidence-based guidelines can undermine effective disease management and increase cardiovascular risk. In South Asia, there is wide variation in prescribe practice with a high proportion of over-prescription of beta-blockers and under prescription of thiazide diuretics and ACEIs reflect despite substantial evidence for their use.

With these considerations in mind, a complete analysis of prescribing practices at one of the major tertiary care hospitals in Bangladesh was considered as necessitated to explore how far they comply with the international standards. This information is important for highlighting deficiencies, enhancing rational drug use, and informing policy strategies to improve hypertension care among diabetes populations. However, the antihypertensive drug prescribing pattern in T2DM patients with hypertension attending tertiary care hospital remains so far unassessed at this part of Bangladesh; therefore, the present study was conducted to assess the antihypertensive prescribing pattern among hypertensive T2DM patients who visited tertiary-level hospital as well as to check these practices against globally accepted medication guidelines.

METHODS

This was an observational, cross-sectional assessment of the prescribing of antihypertensives in hypertensive T2DM. A total of 246 participants were included in the study. The research was conducted in the OPD of Sir Salimullah medical college and Mitford hospital (SSMCH) and Bangladesh institute of research and rehabilitation in diabetes, endocrine, metabolic disorder (BIRDEM). The research was done within 12 months, from August 2021 to July 2022. Patients diagnosed with T2DM and hypertension, who were attending the OPDs of SSMCH and BIRDEM were included in the study.

Inclusion criteria

The subjects were diagnosed as cases of T2DM and HTN from a registered qualified medical practitioner and participants were 40 years or older and included both men and women were included.

Exclusion criteria

Patients with insulin-dependent diabetes mellitus and hypertension, pregnant women and nursing mothers were excluded from the study. The recent history of myocardial infarction or stroke, and people who refused to cooperate were also excluded.

Data collection procedure and tool

Information was obtained through a semi-structured pretested questionnaire. Clinical, demographical and laboratory findings were noted for every individual. All statistical analyses were performed with SPSS software version 23. Categorical variables (gender, comorbidities) were described in terms of percentages and continuous variables by mean±standard deviation. An alpha of 0.05 was considered statistically significant. Standardized checklist and pretested questionnaire were used for data collection in a local language (Bengali) to elicit the information. Furthermore, written consent was taken from the participated patients and there were separate forms in Bengali and English for consent.

Ethical considerations

All subjects gave written informed consent after being carefully introduced to the study objective and procedure.

Participants were requested that they would remain free to decline any questions or discontinue participation at any time without being penalized. The study did not introduce an experimental intervention so risk for physical, psychological or social harm was considered minimal. Confidentiality, and privacy of the participant at all stages were preserved.

RESULTS

A summary of the sociodemographic profile of the 246 respondents the mean age was 59.51±10.49 years, with most (44.8%) ≥60 years old. Females (56%) were more commonly affected compared to males (44%). Regarding marital status, the majority of respondents (96.77%) were married with only 3.23% being single.

A significant proportion (45.56%) was self-employed, indicating that this population may experience work-related stressors contributing to their health conditions.

The average BMI of the respondents was estimated at 27.01, which indicates that most of the participants were either overweight (75.8%) or obese (12.1%), while only a few belonged to the underweight and normal weight category (10% in total). This distribution emphasizes the high rate of overweight and obesity in our study population which is a well-known risk factor for negative health outcomes. Moreover, many respondents (73.45%) were identified to have a high salt intake, as shown.

The duration of DM and hypertension among respondents is presented. The mean duration of diabetes was 12.90±7.17 years, with 50.4% of participants having diabetes for 6 to 15 years.

The prevalence of co-morbidities among the respondents is illustrated by CKD as the most common condition, affecting 37.6% of the study population. This was followed by dyslipidemia, present in 33.1% of participants, and ischemic heart disease (IHD), reported in 29.3%. The mean duration of antihypertensive drugs use among the respondents was 8.60±6.27 years, indicating chronic dependence on drugs for blood pressure control.

Beta-blockers represent the most commonly prescribed group, which amounted to 23.2% of all prescriptions, while they are followed by angiotensin receptor blockers (ARBs) representing 20.8%, and calcium channel blockers (CCBs) accounting for 17.4%. Prescription pattern showed a high usage of combination therapy in 42.43% cases and monotherapy in low method (30%).

An analysis of the relationship between MAP and the number of prescribed drugs showed that patients with stage 2 hypertension (MAP >96 mmHg) were more frequently prescribed multiple agents, with more than two drugs used in over 40% of such cases. This pattern indicates a clear association between elevated MAP and the need for intensified treatment regimens, supporting the principle of stepwise escalation in antihypertensive therapy for severe cases.

Drug preference patterns based on the number of prescribed medications further revealed that beta-blockers and ARBs were consistently favored, regardless of the combination. Beta-blockers, in particular, demonstrated the highest overall usage, with 66 prescriptions recorded, underscoring their continued prominence in hypertension management despite evolving guideline recommendations.

A comparison between the study's findings and the recommendations from prominent guidelines-such as JNC 8, ACC, ADA, and NICE reveal a notable deviation from evidence-based practices. While these guidelines consistently advocate for thiazide diuretics and ACE inhibitors as preferred first-line therapies, the most frequently prescribed drugs in the present study were beta-blockers, accounting for 23.2% of prescriptions

Table 1: Socio-demographic profile of the patients, (n=246).

Variables	N	Percentage
Age (in years)		
Mean±SD	59.51±10.49	
40-49	62	25.0%
50-59	74	30.2%
≥60	110	44.8%
Gender		
Male	108	44%
Female	138	56%
Marital status		
Married	238	96.77%
Unmarried	08	3.23%
Lifestyle characteristics		
Smoking	65	26.55%
Salt intake	181	73.45%
Total	246	100.0%

Table 2: Distribution of BMI among the respondents, (n=246).

BMI types	N	Percentage
Mean±SD	27.01±2.82	
Underweight	03	1.2%
Normal	27	10.9%
Overweight	186	75.8%
Obese	30	12.1%

Table 3: Frequency distribution of diabetes mellitus and the hypertension among the respondents, (n=246).

Variables	N	Percentage
Duration of DM (in years)		
Mean±SD	12.90±7.17	
1-5	48	19.5%
6-10	62	25.2%
11-15	62	25.2%
16-20	47	19.1%
>20	27	11%
Duration of hypertension (in years)		
Mean±SD	8.31±5.783	
<1	15	6.1%
1-5	79	32.1%
6-10	86	35%
11-15	38	15.4%
16-20	24	9.8%

Table 4: Frequency distribution of co-morbidities, anti-hypertensive drugs, duration, and the number of prescribed drugs among the respondents, (n=246).

Variables	N	Percentage
Co-morbidities history		
IHD (Old MI)	72	29.3%
CKD	92	37.6%
Dyslipidaemia	82	33.1%
Duration of the anti-hypertensive drugs taken		
Mean±SD	8.60±6.27	
Types of anti-hypertensive drugs		
ACEIs	60	9.7%
ARBs	129	20.8%
BBs	144	23.2%
CCBs	108	17.4%
Diuretics	77	12.4%
Combine drugs	102	16.5%
Number of prescribed drugs		
1	74	30%
2	129	42.43%
3	33	13.41%
≥4	10	4.06%

Table 5: Distribution of anti-hypertensive drugs according to mean arterial pressure of the patients, (n=246).

Category MAP	Number of prescribed drugs, N (%)				Total	P value
	1 drug	2 drugs	3 drugs	>4 drugs		
Normal (<90 mmHg)	34 (53.125)	29 (45.31)	1 (1.56)	0 (0.0)	64 (100)	0.004
Elevated BP (90 to <92 mmHg)	28 (31.81)	58 (65.91)	2 (2.27)	0 (0.0)	88 (100)	
Stage1 hypertension (92 to <96 mmHg)	5 (11.36)	22 (50)	13 (29.54)	4 (9.09)	44 (100)	
Stage 2 hypertension (>96 mmHg)	7 (14%)	20 (40%)	17 (21.25)	6 (12)	50 (100)	

Table 6: Distribution of anti-hypertensive drugs for the number of prescribed drugs.

Number of prescribed drugs	Prescribe medicine					Total
	ACEIs	ARBs	BBs	CCBs	Diuretics	
1 drug	8	8	14	11	0	41
	19.5%	19.5%	34.1%	26.8%	0.0%	
2 drugs	6	19	23	13	12	73
	8.2%	26.0%	31.5%	17.8%	16.4%	
3 drugs	3	25	16	25	14	83
	3.6%	30.1%	19.3%	30.1%	16.9%	
≥4 drugs	6	12	13	0	6	37
	16.2%	32.4%	35.1%	0.0%	16.2%	
Total	23	64	66	49	32	234

Table 7: Initial drug therapy option according to the different guide lines and compared with this study findings.

JNC 8, ACC, ADA, NICE	JNC 7, ESH	Prescribed anti-hypertensive agents	
Initial drug therapy option	Initial drug therapy option		
Thiazide diuretics	Thiazide diuretics	BBs	23.2%
ACEIs	Beta blockers	ARBs	20.8%
ARBs	ACE inhibitor	CCBs	17.4%
CCBs	ARB	Diuretics	12.4%
	CCBs	ACEIs	9.7%

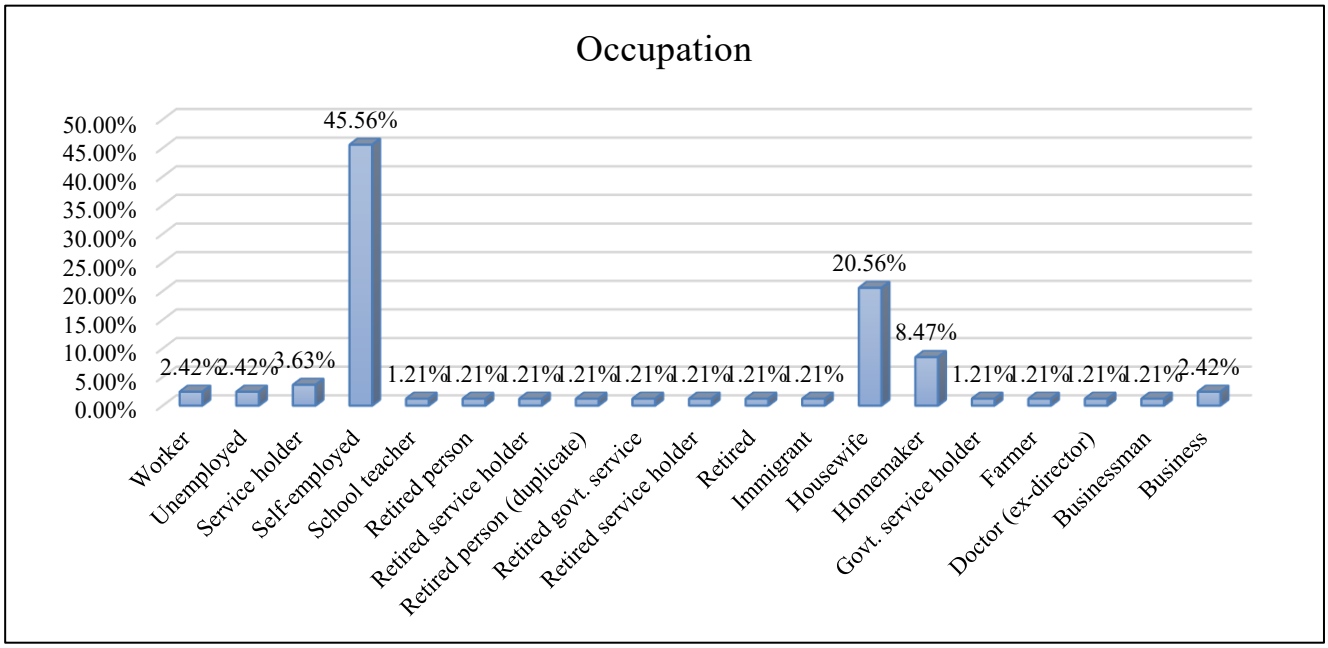

Figure 1: The occupational distribution of respondents revealed that the largest group (45.56%) was self-employed, indicating a substantial proportion engaged in independent work.

DISCUSSION

The current study assessed antihypertensive prescription patterns in hypertensive T2DM patients of tertiary level healthcare centers of Bangladesh and observed significant differences between actual prescription practices and international evidence-based recommendations. The high burden of comorbidities including CKD (37.6%), dyslipidaemia (33.1%) and ischemic heart disease (29.3%) highlights the increased cardiovascular and renal risk profile of this cohort, a pattern that is consistent with previous regional and international cohorts.[1,7] Such comorbidities underscore the need to pursue tight control of blood pressure and pharmacotherapy backed by evidence on longevity, nephroprotection and cardio protection.

There was a very interesting issue in the study, which is that beta-blockers (23.2%) have emerged as the most commonly prescribed antihypertensive drugs. This pattern of prescribing does not mirror guideline-concordant

treatment as first-line therapy for hypertensive diabetics is ACEIs, ARBs, thiazide-type diuretics or CCBs (JNC 8; ADA; ACC/AHA). On the other hand, beta blockers are no longer recommended for initial monotherapy of hypertension in diabetic subjects because of their metabolic disadvantage, their ability to mask hypoglycaemia and their less protective effect against cardiovascular and renal outcomes as compared with ACEIs/ARBs.[8] The prescribing practice is quite similar with previous South Asian studies where beta-blockers are overprescribed even with updated evidence.[9,10]

ARBs (20.8%) and CCBs (17.4%) followed as the next frequently prescribed drugs. This indicates that there is some concurrence with the current guidelines, in that these agents are effective in lowering cardiovascular risk. For α_ moderate use of diuretics and for β low utilization of ACEIs is a worrying finding given their established benefits in the prevention of diabetic nephropathy, albuminuria reduction and long term cardiovascular events.[11] Under prescription of ACEIs and diuretics among this group may be attributable to prescriber reluctance, in regards to electro imbalances, (ACEIs) cough (ACEIs), patient intolerance or lack of availability on institutional formularies. These barriers have also been documented in other resource-limited contexts.

The study also found a high ratio of combined usage (42.4%) that reflects the wider use of combination therapy to assist in achieving a better blood pressure control for patients with chronic disease and multiple concomitant diseases. The positive correlation between the number of drugs and MAP is in line with international guidelines regarding incremental therapy addition in severe HTN.[12] Nevertheless, the common inclusion of beta-blockers in multidrug treatment indicates an ongoing reliance on traditional and empirical prescribing rather than rational ordering for therapeutic regimens.

Comparison to international recommendations demonstrates a striking difference regarding the choice of first-line and second-line treatment. Although the recommendations of JNC 8, and ADA lay a strong emphasis on ACEI or ARBs as preferred drugs in these patients of hypertensive with diabetes (because of their unmatched renal protective effects), our findings are similar to studies from India, Pakistan and Middle East leading to a conclusion that these drugs need to be used more them.[13,14] These trends reinforce concerns regarding possible deficits in continuing medical education, a lack of updated institutional protocols as well financial impact on drug selection.

These variations for Bangladesh may be influenced by several contextual factors such as prescribing traditions, perceived patient affordability of prescribed medication, low diagnostic follow-up (notably that of serum creatinine and potassium-required for ACEI/ARB therapy), and formulary restrictions within public hospitals. Moreover, given the high background CKD rates (approximately 50%) among participants in our study, one would ideally expect nephroprotective agents to dominate, however findings showed otherwise indicating the need for rapid guideline dissemination and prescriber training.[15]

The high percentage of overweight and obese patients (87.9%) illustrates the clustering of lifestyle risk factors in this population, which highlights the importance of a comprehensive management with diet, exercise, salt reduction and smoking cessation. Since 73.45% of participants have high salt intake and 26.55% of them are smokers, drug treatment should be supplemented with key note-comprehensive non pharmacological interventions.[16]

Despite the usefulness of these insights, this study has its limitations. Its cross-sectional nature prevents making causal inferences, and only two tertiary hospitals were included that may not reflect prescribing in rural or primary care. Lifestyle factors were self-reported, which may have led to recall bias, and not all clinical variables (medication adherence, blood pressure control rates and economic issues) were investigated. Nevertheless, despite the limitations, the study offers valuable information on current prescribing behavior and indicates substantial difference between recommended practice in guidelines and actual practice in Bangladesh.

In conclusion, the results underline the urgent importance of better adherence to international hypertension guidelines, increased attention to use ACEI/ARB and thiazides and reducing discrepancy between professional education interventions suggestions. Policy changes, standard treatment regimens and availability of better drugs can support this to be enhanced among diabetic population for better management of hypertension with the aim of reducing heavy burden of cardiovascular diseases in Bangladesh.

Limitations

This study has several limitations. Owing to its cross-sectional nature, no causal relationship can be derived between prescription status and clinical outcome. The study was only carried out at two tertiary hospitals which restricts generalization to primary care or rural practices. Some of the variables such as lifestyle questions were self-reported by patients and are susceptible to recall bias. Key clinical parameters, such as blood pressure control, medication nonadherence, and drug cost or availability were not thoroughly addressed. Furthermore, the new users of antihypertensive treatment could not be separated from those already treated for hypertension. Notwithstanding these limitations, the results do provide valuable information regarding contemporary antibiotic prescribing.

CONCLUSION

The study findings imply that the prescribing antihypertensive among hypertensive T2DM patients in

tertiary hospital of Bangladesh is not entirely according to global standard guidelines. Beta-blockers were the most commonly prescribed class and those with guideline-recommended ACEIs, ARBs, thiazide diuretics and CCBs were disproportionately under prescribed with a high burden of CKD, dyslipidemia and ISH. This pattern indicated potential lost opportunities for the best cardiovascular and renal protection. Merely reinvesting in guidelines from evidence might make prescriber training, new protocol, and easier access to guideline-recommended drugs now all the more important. Additional research is needed in examining obstacles to rational prescribing and assessing the effect of interventions on BP control.

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