EVALUATING THE ROLE OF STRESS AS A POSSIBLE CAUSATIVE FACTOR IN A HIGH INCIDENCE OF DIABETES AND HYPERTENSION AND LOW INCIDENCE OF ASTHMA

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ABSTRACT

Background: Diabetes and hypertension are a public health burden globally including in India and are predisposing factors for stroke, heart diseases, and mortality. Also, Indian subjects are found to have higher levels of stress attributed to socioeconomic status.

Aim: The present study aimed to assess the role of stress as a possible causative factor in a high incidence of diabetes and hypertension and a low incidence of Asthma.

Methods: The study assessed 250 subjects visiting the health care institute in India. The subjects were assessed for the prevalence of asthma, diabetes, and hypertension along with awareness about the diseases and knowledge of the control of these conditions. The subjects were also assessed concerning their experience of stress and the type of stress they encountered.

Results: The study results showed that diabetes was prevalent in 12% (n=30) of study subjects with the highest prevalence in the age range of 40-60 years and hypertension was reported in 46.8% (n=117) of study subjects with the highest incidence in the age range of subjects aged >40 years. The incidence of asthma was lower in all the age groups. Stressful life was seen in 60% (n=150) of study subjects.

Conclusion: A high incidence of diabetes and hypertension is seen in Indian subjects. However, the incidence of Asthma is low with a considerable number of affected subjects being unaware of their diabetes and hypertension status. Exposure to stress in daily life among Indian subjects plays a vital role in the high incidence of these morbid conditions.

Keywords: Asthma, Diabetes, Hypertension, Stress, morbidity

INTRODUCTION

One of the most commonly encountered non-communicable diseases globally is hypertension which leads to a high number of deaths and disabilities every year. Hypertension also remains a main risk factor for stroke and other heart diseases with average blood pressure reaching 140/90 mmHg or higher which affects nearly 20% of the population globally. The prevalence of hypertension is increasing globally and is expected to continue increasing in the coming decade despite controlling blood pressure. Especially in subjects from high-income countries owing to better detection and treatment strategies. As of 2015, hypertension had caused 211.8 million disability-adjusted life years and 10.7 million deaths globally.[1]

Also, the incidence of diabetes is rising globally in young and middle-aged adults causing other complications of diabetes that can be life-threatening and need prompt intervention. These complications can be delayed or prevented with better control of diabetes and sugar levels. The literature data has recently focused on assessing the role of stress in diabetics and its impact on the long-term survival rates in subjects with diabetes following disease onset. However, the literature data is scarce concerning long-term stress exposure on the effect on the survival of subjects with diabetes.[2]

COPD (chronic obstructive pulmonary disease) and Bronchial asthma are other chronic conditions affecting a large population globally including India. These two diseases are debilitating conditions affecting the lungs. Asthma mainly affects children globally and is a major health concern for them. As per WHO estimation, nearly 235 million subjects are affected by asthma.[3] However, these data are considered to be underestimated as asthma in many subjects remains untreated and undiagnosed. The etiology of asthma is not understood completely. However, various factors including air pollution, passive and active tobacco smoke, carpet pollens, cockroaches, house dust mines, and other environmental factors have been attributed to the etiology of asthma which can lead to airway inflammation secondary to environmental exposure or genetic predisposition.[4]

Stress constitutes a major part of daily life in the majority of the subjects and affects the large population in different ways. It is common for individuals to feel stress at one point of time in life. However, an inter-individual variation exists as to how different individuals deal with the stress faced. Stress is mainly characterized by feelings of anger, and frustration, and can also present different psychological or physical symptoms. Stress can be beneficial to a certain extent and can help affected individuals to perform various tasks and deal with different situations. Also, it is seen that excessive stress can worsen various conditions and can lead to different medical situations.[5]

The present study aimed to assess the prevalence of asthma, diabetes, and hypertension in Indian subjects and their correlation with control, awareness, and age of the affected subjects. The study also aimed to assess the relationship between stress levels experienced by subjects in their daily routine life and these morbid conditions. With the understanding of these relations, the study helps in expanding the current knowledge of understanding disease incidence in Indian subjects.

MATERIALS AND METHODS

The present study aimed to assess the prevalence of asthma, diabetes, and hypertension in Indian subjects and their correlation with control, awareness, and age of the affected subjects. The study also aimed to assess the relationship between stress levels experienced by subjects in their daily routine life and these morbid conditions. The study was done after the clearance was given by the concerned Ethical committee of the Institute. The study population was the subjects visiting the Outpatient Department of the Institute. Informed consent, in both written and verbal format, was taken from all the study subjects.

The study included a total of 250 male subjects in the age range of 18 to 60 years with comorbidities including asthma, diabetes, and hypertension. The study included only male subjects to eliminate confounding factors including pregnancy and hormonal changes. All the study data were gathered by a male examiner expert in the field. The exclusion criteria also included subjects of age less than 18 years.

For study inclusion, the subjects were considered for asthma if they were on steroid repetition or on bronchodilators and subjects who reported asthma history on prescribing the NSAIDs. The diabetics were identified if they visited for antidiabetic drug repetition, mentioned diabetes for getting other treatment, and were taking blood glucose monitoring before the consultation. Hypertension was identified if subjects were on antihypertensive drug repetition, mentioned hypertension for getting other treatment, and were taking blood pressure monitoring before the consultation.

After the final inclusion of the study subjects, detailed clinical history was recorded for all the subjects followed by the assessment of the incidence rates for asthma, diabetes, and hypertension. Incidence percentage was assessed as the number of cases for each age group/ Total number of population X 100%. The crude incidence rate was measured as the number of cases for each age group/ Total number of population X 100,000. The age-adjusted incidence rate was assessed as the age distribution of standard population X crude rate.

The data gathered were analyzed statistically using SPSS software version 21.0. The data were expressed as percentages and frequencies. The p-value of <0.05 was considered statistically significant.

RESULTS

The present study aimed to assess the prevalence of asthma, diabetes, and hypertension in Indian subjects and their correlation with control, awareness, and age of the affected subjects. The study also aimed to assess the relationship between stress levels experienced by subjects in their daily routine life and these morbid conditions. The majority of the study subjects were in the age range of 40-60 years with 36% (n=90) subjects followed by 34.4% (n=86) subjects from 18-39 years and at least 29.6% (n=74) subjects from >60 years of age. There were 100% (n=250) males in the present study and no females (Table 1).

Based on the age range of study subjects, 30.8% (n=77) of subjects were single with 51, 23, and 3 subjects respectively from 18-39, 40-60, and >60 years of age respectively and 69.2% (n=173) subjects were married with 35, 67, and 71 subjects respectively from 18-39, 40-60, and >60

years of age respectively. The majority of the study subjects were residents of urban areas with 56% (n=140) subjects with 46, 49, and 45 subjects respectively from 18-39, 40-59, and >60 years of age respectively, whereas, 44% (n=110) subjects from the rural areas with 40, 41, and 29 subjects respectively from 18-39, 40-59, and >60 years of age (Table 2).

On assessing the comorbid state in the study subjects depending on the age range, it was seen that asthma, diabetes, and hypertension were seen in 3.48% (n=3), 9.30% (n=8), and 24.41% (n=21) study subjects respectively. In the 40-60 years of age range, asthma, diabetes, and hypertension were reported in 3.33% (n=3), 14.44% (n=13), and 60% (n=54) study subjects respectively. In the age range of >60 years, asthma, diabetes, and hypertension were respectively seen in 2.70% (n=2), 14.86% (n=11), and 59.45% (n=44) study subjects as shown in Table 3.

For the classification of study participants based on awareness for control of the diseases, in hypertension, for the age range of 18-39 years, 24.41% (n=21) subjects were unaware of the status, 2.32% (n=2) subjects had uncontrolled, non-drug and drug-controlled state was seen in 11.62% (n=10) and 61.62% (n=53) subjects respectively. In 40-60 years, unaware, uncontrolled, non-drug, and drug-controlled status was seen in 22.2% (n=20), 14.4% (n=13), 52.2% (n=47), and 11.1% (n=10) study subjects respectively. In >60 years of age, unaware, uncontrolled, non-drug, and drug-controlled status was seen in 5.40% (n=4), 16.21% (n=12), 66.21% (n=49), and 12.16% (n=9) subjects respectively (Table 4).

For awareness about diabetes control, 17.44% (n=15), 12.22% (n=11), and 4.05% (n=3) subjects respectively from 18-39, 40-60, and >60 years of age were unaware of their diabetic status. Uncontrolled diabetes was seen in 10.46% (n=9), 20% (n=18), and 24.32% (n=18) subjects respectively from 18-39, 40-60, and >60 years had uncontrolled diabetes mellitus. Non-drug-controlled diabetes mellitus was seen in 22.09% (n=19), 14.44% (n=13), and 9.45% (n=7) study subjects respectively from 18-39, 40-60, and >60 years, whereas, drug-controlled diabetes mellitus was seen in 50% (n=43), 53.3% (n=48), and 62.16% (n=46) subjects respectively from 18-39, 40-60, and >60 years of age respectively (Table 4).

The number of comorbidities in the study subjects based on the age distribution of the study subjects was assessed and the results were summarized in Table 5. In the age range of 18-39 years, comorbidities including hypertension/diabetes, hypertension/asthma, diabetes/asthma, and hypertension/diabetes/asthma were seen in 5, 4, 5, and 3 subjects respectively. In the 40-60 years of age range, comorbidities including hypertension/diabetes, hypertension/asthma, diabetes/asthma, and hypertension/diabetes/asthma were recorded in 20, 8, 13, and 2 subjects respectively. In >60 years of age, hypertension/diabetes, hypertension/asthma, diabetes/asthma, and hypertension/diabetes/asthma were seen in 30, 8, 8, and 1 subjects respectively (Table 5).

DISCUSSION

In the present study, the majority of the study subjects were in the age range of 40-60 years with 36% (n=90) subjects followed by 34.4% (n=86) subjects from 18-39 years and least 29.6% (n=74) subjects from >60 years of age. There were 100% (n=250) males in the present study and no females. Based on the age range of study subjects, 30.8% (n=77) of subjects were single with 51, 23, and 3 subjects respectively from 18-39, 40-60, and >60 years of age respectively and

69.2% (n=173) subjects were married with 35, 67, and 71 subjects respectively from 18-39, 40-60, and >60 years of age respectively. The majority of the study subjects were residents of urban areas with 56% (n=140) subjects with 46, 49, and 45 subjects respectively from 18-39, 40-59, and >60 years of age respectively, whereas, 44% (n=110) subjects from the rural areas with 40, 41, and 29 subjects respectively from 18-39, 40-59, and >60 years of age. These findings were similar to the studies of Persson R et al[6] in 2021 and Petri D et al[7] in 2021 where authors assessed subjects with demographic data comparable to the present study.

The study results showed that for the comorbid state in the study, subjects depending on the age range, it was seen that asthma, diabetes, and hypertension were seen in 3.48% (n=3), 9.30% (n=8), and 24.41% (n=21) study subjects respectively. In the 40-60 years of age range, asthma, diabetes, and hypertension were reported in 3.33% (n=3), 14.44% (n=13), and 60% (n=54) study subjects respectively. In the age range of >60 years, asthma, diabetes, and hypertension were respectively seen in 2.70% (n=2), 14.86% (n=11), and 59.45% (n=44) study subjects. These results were consistent with the studies of Lehrer P et al[8] in 2002 and Vink NM et al[9] in 2013 where authors reported the presence of a comparable proportion of these diseases with age as in the present study.

It was seen that concerning the classification of study participants based on awareness for control of the diseases, in hypertension, for the age range of 18-39 years, 24.41% (n=21) subjects were unaware of the status, 2.32% (n=2) subjects had uncontrolled, non-drug and drug-controlled state was seen in 11.62% (n=10) and 61.62% (n=53) subjects respectively. In 40-60 years, unaware, uncontrolled, non-drug, and drug-controlled status was seen in 22.2% (n=20), 14.4% (n=13), 52.2% (n=47), and 11.1% (n=10) study subjects respectively. In >60 years of age, unaware, uncontrolled, non-drug, and drug-controlled status was seen in 5.40% (n=4), 16.21% (n=12), 66.21% (n=49), and 12.16% (n=9) subjects respectively. These results were in agreement with the findings of Chen E et al[10] in 2007 and Sutherland ER et al[11] in 2003 where a similar level of awareness as of the present study was reported by the authors in their respective studies.

It was seen that for the awareness about diabetes control, 17.44% (n=15), 12.22% (n=11), and 4.05% (n=3) subjects respectively from 18-39, 40-60, and >60 years of age were unaware of their diabetic status. Uncontrolled diabetes was seen in 10.46% (n=9), 20% (n=18), and 24.32% (n=18) subjects respectively from 18-39, 40-60, and >60 years had uncontrolled diabetes mellitus. Non-drug-controlled diabetes mellitus was seen in 22.09% (n=19), 14.44% (n=13), and 9.45% (n=7) study subjects respectively from 18-39, 40-60, and >60 years, whereas, drug-controlled diabetes mellitus was seen in 50% (n=43), 53.3% (n=48), and 62.16% (n=46) subjects respectively from 18-39, 40-60, and >60 years of age respectively. These results were in line with the findings of Marin TJ et al[12] in 2009 and Fei G et al[13] in 2004 where similar diabetes awareness based on the age range was seen in the study subjects of the authors.

The study results showed that in the age range of 18-39 years, comorbidities including hypertension/diabetes, hypertension/asthma, diabetes/asthma, and hypertension/diabetes/asthma were seen in 5, 4, 5, and 3 subjects respectively. In the 40-60 years of age range, comorbidities including hypertension/diabetes, hypertension/asthma, diabetes/asthma, and

hypertension/diabetes/asthma were recorded in 20, 8, 13, and 2 subjects respectively. In >60 years of age, hypertension/diabetes, hypertension/asthma, diabetes/asthma, and hypertension/diabetes/asthma were seen in 30, 8, 8, and 1 subjects respectively. These results were consistent with the studies of Shin YS et al[14] in 2014 and Longo M et al[15] in 2019 where authors suggested a similar prevalence of various comorbid conditions as seen in the present study.

CONCLUSION

Considering its limitations, the present study concludes that a high incidence of diabetes and hypertension is seen in Indian subjects. However, the incidence of Asthma is low with a considerable number of affected subjects being unaware of their diabetes and hypertension status. Exposure to stress in daily life among Indian subjects plays a vital role in the high incidence of these morbid conditions.

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TABLES

S. No	Characteristics	Number (n)	Percentage (%)
1.	**Age range (years)**		
a)	18-39	86	34.4
b)	40-60	90	36
c)	>60	74	29.6
2.	**Gender**		
a)	Males	250	100
b)	Females	0	0

Table 1: Age and gender distribution in the study subjects

S. No	Characteristic	Age range (years)			Number (n)	Percentage (%)
		18-39	**40-59**	**>60**		
1.	**Marital status**					
a)	Single	51	23	3	77	30.8
b)	Married	35	67	71	173	69.2
2.	**Residence**					
a)	Rural	40	41	29	110	44
b)	Urban	46	49	45	140	56

Table 2: Age-related distribution of different demographic data in the study participants

S. No	Comorbid state	Age-based incidence		
		18-39 % (n=86)	**40-60 % (n=90)**	**>60 % (n=74)**
1.	**Asthma**	3.48 (3)	3.33 (3)	2.70 (2)
2.	**Diabetes**	9.30 (8)	14.44 (13)	14.86 (11)
3.	**Hypertension**	24.41 (21)	60 (54)	59.45 (44)

Table 3: Incidence of Asthma, diabetes, and hypertension in the study subjects

S. No	Age range (years)	Unaware % (n)	Controlled		Uncontrolled % (n)
			Non-drug % (n)	**Drug % (n)**	
1.	**Hypertension**				
a)	18-39 (n=86)	24.41 (21)	11.62 (10)	61.62 (53)	2.32 (2)
b)	40-60 (n=90)	22.2 (20)	14.4 (13)	52.2 (47)	11.1 (10)

c)	>60 (n=74)	5.40 (4)	16.21 (12)	66.21 (49)	12.16 (9)
2.	**Diabetes**				
a)	18-39 (n=86)	17.44 (15)	22.09 (19)	50 (43)	10.46 (9)
b)	40-60 (n=90)	12.22 (11)	14.44 (13)	53.3 (48)	20 (18)
c)	>60 (n=74)	4.05 (3)	9.45 (7)	62.16 (46)	24.32 (18)

Table 4: Classification of study participants based on awareness for control of the diseases

S. No	Age range (years)	Hypertension/ Diabetes	Hypertension/ asthma	Diabetes/Asthma	Hypertension/ diabetes/ asthma
1.	**18-39 (n=86)**	5	4	5	3
2.	**40-60 (n=90)**	20	8	13	2
3.	**>60 (n=74)**	30	8	8	1

Table 5: Study subjects with comorbidities of hypertension, diabetes, and/or asthma