



Original Article

Incidence of essential hypertension in young adult males followed for over two decades

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ABSTRACT

Background: The data about the incidence of hypertension in India is scarce and is lacking about hypertension in young adult patients. We studied the incidence of hypertension in a cohort of young adult male military personnel followed for a long duration.

Methods: The data for this retrospective, observational study was derived from the electronic medical records (EMR) of the male service personnel enrolled between 1990 and 2015. All subjects were recruited before 18 years of age in good health without any disease. Hypertension in young adults was defined as the onset of the disease prior to 45 years of age. We calculated the incidence rates as per person years using appropriate statistical methods.

Results: Our study population includes 51,217 participants (median age 33 years, range 17–54) with a mean follow up of 12.5 years, giving a total observation period of 613,925 person-years (py). During the study period, 360 patients developed hypertension, giving an incidence rate of 58.6 per 100,000 py (95% CI 52.8–64.9). The mean age at the time of diagnosis was 33.5 ± 5.7 years (range 20–45) with 5.6 ± 3.9 years (range 0.3–21 yr) of follow up after the diagnosis. Only 16 patients (4.4%) had associated cardiovascular complications attributable to hypertension.

Conclusion: Our cohort had low incidence rates of hypertension when compared with other studies from abroad. Active military service may offer protection from the hypertension and associated complications.

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1. Introduction

The prevalence of non-communicable disorders (NCD) is rising in alarming proportions in India.¹ Hypertension is a common NCD that affects more than 70 million patients in India and is the leading cause of the cardiovascular deaths and disability.² There is a rise in the prevalence of hypertension in both urban and rural areas during the last few decades.³ Rapid urbanization and changing lifestyle have contributed maximum to the observed rise in the prevalence.⁴ Hypertension is broadly divided as essential hypertension (idiopathic) and secondary hypertension (secondary to a known etiology). Essential hypertension is seen in more than two thirds of individuals with hypertension, even in younger patients. Hypertension in young is defined as the onset of the disease prior to 45 years of age.⁵ It is often asymptomatic at this age and contributes significantly to the cardiovascular morbidity and mortality in the productive age group. The common risk

factors for hypertension include the obesity, positive family history and sedentary lifestyle.⁶

Many epidemiological studies have described the prevalence of hypertension in India, even in the urban, rural and tribal settings.^{7–9} However, extensive literature search did not reveal a single study that described the incidence of the hypertension in the community. The incidence of a disease is more significant in identifying the demographic trends and disease burden of a chronic disease. This data also helps in identifying the priority areas for resource allocation. A limited number of studies from the Western population are available about the incidence of the hypertension.^{10,11} The observed incidence rates vary between 12 and 26 per 100 person-years depending on the population studied and the definition of the hypertension. A small cohort study from South India has shown a high incidence rate of hypertension in the population.¹² There are no studies that have assessed the incidence rates of hypertension in young adults with Pan-Indian representation of the study sample. Hence, we conducted this study to assess the incidence of hypertension in a young adult male population followed for a long duration.

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2. Materials and methods

2.1. Study procedure

We conducted a retrospective analysis of the electronic medical records (EMR) data pertaining to the personnel of our organization as shown in Fig. 1. Our organization consists of around 55,000 health care personnel (HCP) working at various primary, secondary and tertiary level health care centers, providing health care services to the armed forces and their dependent family members. The HCP includes all the persons employed in various hospitals for the provision, assistance, maintenance and upkeep of the health services. The sickness and hospitalization record of all the HCP is captured in the EMR database. All disabilities that require long term observation and therapy are recorded in the EMR and the patients are reviewed periodically. The disorders are entered into the EMR as per the ICD (International Classification of Diseases) classification. Our organization does not enlist females in the personnel below officer rank, thereby limiting this data to males only. The data were derived from the EMR hence the institutional ethical committee permission was not obtained separately.

2.2. Study population

The participants of this study were enrolled in the active military service from the year 1990 onwards. They were selected into the army before the age of 18 years and are in good physical and mental health at the time of recruitment. None of the study participants had a diagnosis of hypertension prior to the entry into the service. The EMR provided the data on occupational and demographic particulars that includes age, educational level, marital status, medical diagnosis and age at the time of the diagnosis. The study population is educated below graduate level and is derived mostly from the rural background. The diagnosis of hypertension was identified from the EMR using the ICD codes and not by perusing the individual medical records. We have used the ICD 9 (codes 401–404) and the ICD 10 (code I10) for the diagnosis of

hypertension. We also checked for the cardiovascular complications of the hypertension using the relevant ICD codes in the ICD 9 and ICD 10 in all the study population. In this study, we excluded patients with secondary hypertension and above 45 years of age at the time of diagnosis of hypertension.

2.3. Statistical analysis

We calculated the incidence rate as the number of new cases of hypertension diagnosed (numerator) per year divided by the total number of person years follow-up (denominator). The index year was noted based on the first entry of the medical condition in the record of the individual. We did not calculate the incidence rates as per the age and year due to the small number of patients with hypertension.

3. Results

The study participants consist of 51,217 males followed up for a mean duration of 12.5 years. The median age of the study population was 33 years with a range between 17 and 54 years. The population had a mean follow up duration of 12.5 years, giving a cumulative follow up duration of 613,925 person-years (py) of observation. A total of 360 patients developed hypertension during the study period, giving an incidence rate of 58.6 per 100,000 py (95% CI 52.8–64.9). The mean age of the patients at the time of diagnosis was 33.5 ± 5.7 years (range 20–45) with a mean duration of follow up after diagnosis of 5.6 ± 3.9 years (range 0.3–21). The data about the complications revealed that, 16 patients (4.4%) had cardiovascular complications during the observation period. They include 14 patients with ischemic heart disease and two patients had a cerebrovascular accident. The detail about the number of the patients with the complications based on the ICD codes is given in Table 1. Our EMR database did not reveal the presence of any other cardiovascular complication. Another notable feature is that none of the patients showed the microvascular complications in form of retinopathy or nephropathy. The data pertaining to the deceased is not available precluding the assessment of the contribution by the hypertension.

4. Discussion

Our study gave the incidence rate of hypertension in young adults from a large population representing the entire country. The incidence observed in our study is markedly lower when compared with other studies.¹³ Beunza et al. has given an IR of 820 per 100,000 py in a cohort of university graduates, whereas the Framingham cohort has shown an IR of 1400 per 100,000 in young adults.^{14,15} The lowest incidence rates in our study could be explained by multiple reasons. Firstly, our population is relatively young with a median age of 33 yr and hence they are at a lower risk of hypertension. Secondly, our study population is in active military service that involves good lifestyle measures and regular exercise. Previous reports involving military subjects have shown that the incidence of hypertension was lower in comparison to

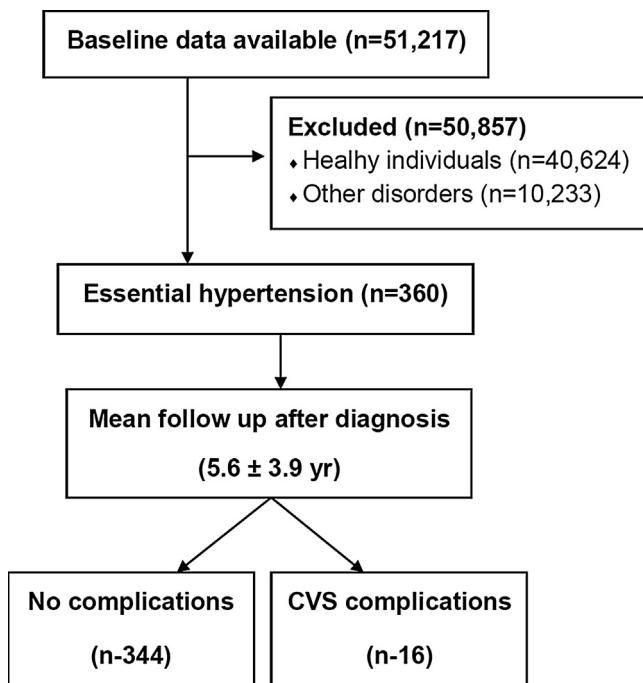


Fig. 1. Flow diagram of the study.

Table 1

Data about the cases and complications including the ICD codes.

Feature	ICD code	N (%)
Primary hypertension	401–404 (ICD 9) I10 (ICD 10)	360 (0.7)
Ischemic heart disease	ICD 9 code 414.9	14 (3.9) ^a
Cerebrovascular accident	ICD 9 code 434.9	2 (0.56)

^a Out of 360 patients with hypertension.

general population.^{5,16} The racial and gender differences could also contribute to the lower IR in our study. Obarzanek et al. have studied the incidence of hypertension in adolescent females and showed that the incidence was higher in obese girls and those belonging to African-American race in comparison to Caucasians.¹⁷ Hypertension is an asymptomatic disease and we could have missed them in the calculation of the incidence. This could have also contributed to the low incidence rate observed in our study.

The data from the developed world showed a lower incidence rate of hypertension in military population when compared with the general population.^{18,19} This confirms the observations of our study and emphasizes that good lifestyle measures are the key factor in the prevention of the hypertension. The military service involves excessive physical and mental stress for the soldiers. Stress in any form has been shown to increase the risk of the hypertension and diabetes.²⁰ However, our data showed that despite a high stressful job the incidence of the hypertension is limited possibly due to better lifestyle modification. Previous reports have shown the prevalence rates of hypertension between 2 and 5% of young military recruits of Asian and Caucasian races.^{16,19}

Hypertension is the leading cause of the ischemic heart disease and the cerebrovascular accident.^{21,22} Another important finding of our study is the low prevalence of the morbidity of the hypertension and also the associated cardiovascular complications. This could be explained by the short duration of the follow up after the diagnosis of hypertension (5.6 years) and also the young age (33 years) of the patients. The lack of other complications could be explained by the trivial nature of them not being recorded as a separate disability in the EMR. A patient with early nephropathy or retinopathy could have been explained about the precautions without documenting the same in the database.

The strengths of our study include data retrieval from a significant number of healthy, young individuals with a long duration of follow up. However, our study also has certain limitations. Firstly, the data does not give provide any information about the female sex. Secondly, our incidence data being derived from the service population may not be applicable to the general population. Thirdly, the data does not include the persons treated outside our hospitals. Lastly, a rare possibility of clerical error of ICD coding exists as we have not perused the original medical records of the patients. Another limitation is the lack of personal and demographic details including the dietary habits of the study participants that could explain the low incidence of hypertension in our study.

To conclude, we report a lower incidence rate of hypertension in young adults from a large military population of India. Further large scale population studies are essential to delineate the epidemiological trends of the NCDs, especially hypertension.

Competing interests

The authors declare that they have no conflict of interest.

Financial disclosures

Nothing to declare.

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