

Shadow beneath the Lamp? The high burden of Diabetes and Hypertension in the workforce of health department, Karnataka, South India

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ABSTRACT

BACKGROUND: Among the NCDs in India, type 2 diabetes Mellitus (T2DM) and hypertension are the major diseases leading to catastrophic complications such as coronary heart disease (CHD), renal impairment, stroke and death. It is important therefore to detect the burden of these diseases in specified populations

MATERIALS AND METHODS: A cross-sectional survey of 510 persons working at the state level directorate of health was done to assess the burden of Type 2 Diabetes Mellitus (T2DM) and Hypertension (HTN). Anthropometric measurement of the staff was recorded along with the blood pressure and random blood glucose levels. The objective of the study was to estimate the burden of select NCDs and associated risk factors in the employees of Directorate of Health and Family Welfare Services, Karnataka (DHFWS).

RESULTS: We observed that 40% of the workforce in the health directorate was overweight and 11% were obese. 18% had T2DM and 31% had hypertension.

CONCLUSIONS: The study indicates high proportion of diabetes and hypertension in the staff of health department. Routine screening and medical check-up programs are recommended to identify the risk category and timely intervention.

Introduction

Non-communicable diseases (NCDs) are the leading cause of death globally, killing more people each year than all other causes combined(1). Non-communicable diseases are increasing rapidly in the low middle income

countries due to the demographic transition and changing lifestyles among people (2). It is expected that by 2020, NCDs will account for 69% of all deaths in low and middle-income countries (LMICs) (3, 4). Recent studies have shown that burden of T2DM is rising rapidly in India (5). India had 65.1 million persons with diabetes in 2013 and is projected to increase 109 million by 2035 unless immediate action is initiated(5). The recent ICMR-India DIABetes (ICMR-INDIAB) study reported the prevalence of Type 2 Diabetes Mellitus (T2DM) (both known and newly diagnosed) in 4 regions of the country:

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10.4% in Tamil Nadu, 8.4% in Maharashtra, 5.3% in Jharkhand, and 13.6% in Chandigarh (6). Similarly, a recent meta-analysis of studies on hypertension (HTN) in India reported pooled prevalence of 21.1% (20.1–22.0) in the rural and 31.8% (30.4–33.1) in the urban south Indian populations (7).

Among the NCDs in India, type 2 diabetes Mellitus (T2DM) and hypertension are the major diseases leading to catastrophic complications such as coronary heart disease (CHD), renal impairment, stroke and death. It is important therefore to detect the burden of these diseases in specified populations. Also, it is important to investigate the role of modifiable risk factors resulting in NCDs such as unhealthy dietary habits, physical inactivity, smoking, harmful alcohol consumption, and stress. Understanding the nature and burden of these risk factors will enable the planning and interventions to reduce the NCD burden. Most of the risk factors leading to hypertension and T2DM are modifiable and therefore provide an opportunity for preventive efforts (3, 8, 9). Hence any intervention that can successfully prevent or reduce hypertension and T2DM should be viewed as promoting cardiovascular health of individuals. There is an imperious need for research in occupational settings to understand the determinants influencing the choices and options for people to smoke, not exercise and overeat (10). Workplace settings provide opportunities to explore determinants of these negative behaviors (11).

The professionals working in the health department are expected to be conversant with the hazards of NCD risk factors. Therefore, it is important to examine whether it impacts these professionals to make positive changes in their health. Primary data on the prevalence of hypertension and T2DM in specific occupational

groups is scarce. Although studies have been undertaken on varied professions, limited data exists on prevalence of Hypertension & T2DM among the Government employees. To our knowledge, there are no studies on the prevalence of hypertension & Diabetes Mellitus among Health Department staff. Health department professionals represent a large proportion of the working population. The objective of the study was to estimate the burden of select NCDs and associated risk factors in the employees of Directorate of Health and Family Welfare Services, Karnataka (DHFWS).

Methods

A cross-sectional survey was done in the professionals working in the Directorate of Health & Family Welfare services, Karnataka. All the staff of the Directorate of Health & FW Services (both permanent and contract staff) formed the sampling frame of the study. Among the total of 731 employees, 622 were permanent staff and 109 were contractual staff. The workforce in the directorate comprises of four groups with Group A representing the highest in hierarchy of being senior officers with B, C and D categories lower in the category representing officers, administrative and support staff respectively.

Study Design: This cross-sectional study was done using a semi-structured questionnaire. Data regarding age, sex, type of occupation (sedentary/ field work), socio-economic status, physical & social environment, diet pattern, substance abuse (smoking/alcoholism/drugs/tobacco), family history of Diabetes/Hypertension and personal history of T2DM/HTN was collected. Anthropometric measurements were taken and measurement of BP and Random Blood Sugar was done at the place of their working.

Figure 1. Diagram describing the flow of participants during the quantitative phase

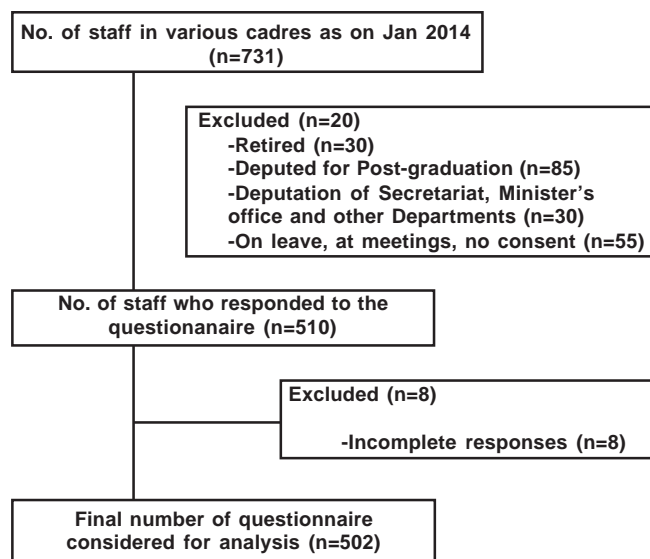


Figure 1: Flow of participants during the qualitative phase:

The data on the sample frame was collected during January 2014 (staff as on October 2013). Around 30 have retired during the period from October '13 to April '14. The sample frame comprised 85 medical officers deputed for post-graduation in various colleges in Bangalore and around 30 who were on deputation to secretariat, minister's office and other departments from the health directorate. We had to include them in the frame as their salary was disbursed at the health directorate though they don't work at the directorate currently. Hence, around 145 were not included in the study as they were not present in the study area at the time of survey. Another 55 were not available for the survey due to leave, deputations for various meetings and due to non-participation. Hence, 200 staff members were not part of the survey. Out of the 531 available, most of the (510) workers returned the filled questionnaires, out of which 8 questionnaires were incomplete. Hence only 502 individuals were considered for the analysis (Figure 1).

Data Collection

While conducting the survey, every section of the health directorate was visited. The heads of the sections and the staff were contacted and were briefed about the study topic. Written informed consent was obtained from the participants and semi-structured questionnaire was distributed to those who gave their consent to participate in the study. The participants were briefed regarding the method of filling the questionnaire and information was collected. A self-administered questionnaire was distributed to collect the information on the number of years of service, risk factors like work stress, type of work, travel stress, salary satisfaction, evaluation of work, appreciation of work and stressors in the physical environment. The questionnaire also collected the information regarding age, sex, socio economic status, family history of DM / HTN, use of tobacco, alcohol, physical inactivity, history of T2DM/ HTN.

All the measurements were recorded at their working place while at work. Anthropometric measurements of the staff were taken using measuring tape & digital weighing machine. The collected information on anthropometric measurements included height; weight, waist (measured at the level of umbilicus, with the help of measuring tape) and hip circumferences (measured at the widest portion of the buttocks with the tape parallel to the floor) were measured and recorded to the nearest centimeters.

Blood Pressure was recorded using an electronic BP apparatus (OMRONM3 IT © OMRON Healthcare Europe B.V.). The participants were instructed not to consume coffee/tea half an hour before the BP measurement. Questionnaires were distributed at the time of the 1st recording of BP. 2nd recording of BP was done after 20 minutes

after the 1st recording, at the time of collecting back the filled questionnaire. BP was measured in sitting posture. We followed the modified Schnall and Belkic protocol of obtaining point estimates of BP approximating ambulatory BP.(12, 13)As per the protocol, BP was measured twice instead of taking an average of 1st and 2nd reading; we used only 2nd reading. BP classification was done based on 8th report of Joint National Commission (JNC-VIII) (14).

We used WHO criteria to define overweight and obesity among study individuals(15). Screening for assessing proportion of diabetics was done through random blood glucose measurement using capillary blood from the fingertip with glucometer (16). A value of RBS e"200mg/dl was categorized as Diabetics and referred to Dispensary/ Government Hospital for treatment.(16). The participants were thanked for participating in the study and a booklet containing information on Diabetes and Hypertension in the local language was given to the participants.

Statistical Analysis: Analysis was done using SPSS software. Descriptive analysis was done for demography data. Frequencies and percentages have been reported for categorical variables and mean along with Standard deviation have been reported for continuous variables. The univariate analyses were done across the categorical variable to identify the risk factors associated with hypertension and diabetes mellitus.

Ethical Considerations: Written informed consent was taken from the participants. Identifying information of the participants was not collected. Each participant was allotted a unique ID, which linked the information of the participant for the purpose of analysis. All precautions were taken to maintain

confidentiality. Ethical approval was obtained from the Institutional Ethical Committee (IEC) at IIPHH, Bangalore Campus. Administrative permission to conduct the study was taken from the Director and Chief administrative officer (Health), Karnataka.

Results

Data from 502 participants was considered for analysis. A total of 274 (54.6%) males were included in the study. The age range of the study population was between 18- 66 years with a mean of 43.5 years with SD of 11.4. Majority of the study population (30%) were in the age group ranging 46-55 years. Majority (86%) of the participants were married, 35% were graduates (Table 1).On examining BMI, majority of the participants were overweight (40.2%), obese (11.8%), 45.2% of the participants had normal weight and <3% were underweight. The waist-to-hip ratio of 362 (72%) of participants was substantially increased (above 0.90 cm). Among the participants, 89% reported of not using tobacco ever and 21% reported alcohol consumption. About 70% (353) of the participants were engaged in physical activity.

Burden of Diabetes: In the entire sample of 502 samples, 91 (18%) were diabetics. Out of 274 males, 49 (17.9%) indicated that they knew their diagnosis of T2DM. Among the 225 men who were not diagnosed earlier, we found that 10 (4.4%) had T2DM. In females (228), 26 (11.4%) knew their diagnosis, while we diagnosed 6 new cases (3%). Of the newly diagnosed 16 (3.7%) had diabetes.

Burden of Hypertension: In the total sample of 502 professionals, 157 (31%) were found to be hypertensive. Out of 274 males, 55 (20%) knew their hypertensive status, while 14 were

Table 1. Demographic distribution of study participants (N=50)

| Variable | Category | Frequency | Percent |
|----------------------------|--|-----------|---------|
| Gender | Female | 228 | 45.4 |
| | Male | 274 | 54.6 |
| Age (years) | 1) <25 | 33 | 6.6 |
| | 2) 26 - 35 | 110 | 21.9 |
| | 3) 36 - 45 | 119 | 23.7 |
| | 4) 46 - 55 | 150 | 29.9 |
| | 5) 56> | 90 | 17.9 |
| Marital Status | Married | 432 | 86.1 |
| | Widow | 30 | 30 |
| | Divorcee | 38 | 7.6 |
| | Never Married | 4 | 0.4 |
| Caste | General | 312 | 62.2 |
| | Other backward Caste | 121 | 24.1 |
| | Scheduled caste | 50 | 10 |
| | Scheduled Tribe | 19 | 3.8 |
| Education | Primary | 62 | 12.4 |
| | Secondary | 180 | 35.9 |
| | Degree | 177 | 35.3 |
| | Post-Graduation | 83 | 16.5 |
| Body Mass Index | Underweight (≤ 18.5) | 14 | 2.8 |
| | Normal weight (18.5-24.9) | 227 | 45.2 |
| | Overweight (25-29.9) | 202 | 40.2 |
| | Obesity ≥ 30 | 59 | 11.8 |
| Waist Hip ratio | Normal | 140 | 27.9 |
| | Substantial Increased risk (>0.90 cm) | 362 | 72.1 |
| Tobacco (ever) | No | 448 | 89.2 |
| | Yes | 54 | 10.8 |
| Tobacco current use | No | 466 | 92.8 |
| | Yes | 36 | 7.2 |
| Alcohol | No | 396 | 78.9 |
| | Yes | 106 | 21.1 |
| Physical Activity | No Exercise | 30 | 29.7 |
| | Exercises | 353 | 70.3 |
| Employment type | Permanent | 347 | 69.1 |
| | Contractual | 155 | 30.9 |

Table 2. Proportion of professionals in DHFWS with Diabetes and Hypertension

| | Diabetes | | Total (N=502) | Hypertension | | Total (N=502) |
|----------------|-----------|-----------|------------------|--------------|-----------|------------------|
| | Female | Male | | Female | Male | |
| | (N=228) | (N=274) | | (N=228) | (N=274) | |
| Known Cases | 26 | 49 | 75 | 30 | 55 | 85 |
| Newly screened | 6 | 10 | 16 | 58 | 14 | 72 |
| Total | 32 | 59 | 91 | 88 | 69 | 157 |

diagnosed afresh. Among 228 females, 30 (13.2%) had history of hypertension and in the remaining 198, 58 of them were diagnosed as hypertensive. (Table 2). Of the newly screened, 72 (14%) were found to be hypertensive

Majority of them are in the habit of walking (83%) and most (60%) of them are into daily habit of some form of activity. About 80% of them have started to exercise in the past 3 years. 30% of those exercising admit that they were advised to exercise due to some disease.

Table 3. Associated risk factors identified through univariate analysis among workers of DHS.

| Variables (categories) | Dependent Variable | | | | | | | |
|---------------------------|--------------------|-----------------------|----------------|-------------|----------------|------------------|----------------|-------------|
| | Normal (N%) | Hyperten sion (N%) | Chi- square | p- value | Normal (N%) | Diabetes (N%) | Chi- square | p- value |
| Age | | | 16.99 | 0.00 | | | 8.82 | 0.04 |
| 25 | 31(9) | 0 | | | 33(8) | 0 | | |
| 26-35 | 92(26.7) | 7(30.6) | | | 103(25.1) | 0 | | |
| 36-45 | 88(25.5) | 22(30.6) | | | 100(24.3) | 5(31.2) | | |
| 46-55 | 89(25.8) | 27(37.5) | | | 116(28.2) | 7(43.8) | | |
| e"56 | 45(13) | 16(22.2) | | | 59(14.4) | 4(25) | | |
| | 345 | 72 | | | 411 | 16 | | |
| Gender | | | | | | | | |
| Male | 161(46.7) | 58(80.6) | 27.43 | 0.00 | 215(52.3) | 10(62.5) | 0.64 | 0.45 |
| Female | 184(53.3) | 14(19.4) | | | 196(47.7) | 6(37.5) | | |
| Marital Status | | | 9.98 | 0.01 | | | 3.26 | 0.329 |
| Currently married | 291(84.3) | 64(88.9) | | | 346(84.2) | 14(87.5) | | |
| Widow | 17(4.9) | 6(8.3) | | | 25(6.1) | 2(12.5) | | |
| Divorce | 1(0.3) | 1(1.4) | | | 2(0.5) | 0 | | |

| Variables (categories) | | | Dependent Variable | | | | | |
|------------------------|-------------|--------------------|--------------------|-------------|-------------|---------------|------------|-------------|
| | Normal (N%) | Hyperten sion (N%) | Chi-square | p-value | Normal (N%) | Diabetes (N%) | Chi-square | p-value |
| Never Married | 36(10.4) | 1(1.4) | | | 38(9.2) | 0 | | |
| Caste | | | | | | | | |
| SC | 34(9.9) | 7(9.7) | 1.21 | 0.75 | 42(10.2) | 0 | 10.08 | 0.01 |
| ST | 1(3.2) | 4(5.6) | | | 14(3.4) | 3(18.8) | | |
| OBC | 84(24.3) | 17(23.6) | | | 105(25.5) | 1(6.2) | | |
| GEN | 216(62.6) | 44(61.1) | | | 250(60.8) | 12(75) | | |
| Education | | | | | | | | |
| Primary | 40(11.6) | 13(18.1) | 4.73 | 0.19 | 42(10.2) | 3(18.8) | 10.43 | 0.01 |
| Secondary | 116(33.6) | 29(40.3) | | | 142(34.5) | 6(37.5) | | |
| Degree | 131(38) | 20(27.8) | | | 152(37) | 5(31.2) | | |
| Post-graduation | 58(16.8) | 10(13.9) | | | | | | |
| Employment type | | | | | | | | |
| Permanent | 216(62.6) | 57(79.2) | 7.22 | 0.00 | 264(64.2) | 15(93.8) | 5.92 | 0.01 |
| Contractual | 129(37.4) | 15(20.8) | | | 147(35.8) | 1(6.2) | | |
| Work experience | | | | | | | | |
| <2 years | 24(7) | 4(5.6) | 10.16 | 0.03 | 28(6.8) | 0 | 9.36 | 0.03 |
| 2-5years | 55(5.9) | 6(8.3) | | | 64(5.6) | 0 | | |
| 5-10years | 65(18.8) | 6(8.3) | | | 76(17) | 0 | | |
| 10-25years | 110(31.9) | 31(43.1) | | | 131(31.9) | 9(56.2) | | |
| >25years | 91(26.4) | 25(34.7) | | | 118(28.7) | 7(43.8) | | |

Table 4. Associated risk factors identified through univariate analysis among workers of DHS.

| Variables (categories) | Dependent Variable | | | | | | | |
|---------------------------------------|--------------------|--------------------|------------|---------|-------------|---------------|------------|-------------|
| | Normal (N%) | Hyperten sion (N%) | Chi-square | p-value | Normal (N%) | Diabetes (N%) | Chi-square | p-value |
| BMI | | | | | | | | |
| Underweight | 14(4.1) | 0 | 5.95 | 0.10 | 14(3.4) | 0 | 1.28 | 0.73 |
| Normal | 169(49) | 29(40.3) | | | 187(45.5) | 8(50) | | |
| Overweight | 131(38) | 36(50) | | | 163(39.7) | 5(31.2) | | |
| Obese | 31(9) | 7(9.7) | | | 47(11.4) | 3(18.8) | | |
| WHR | | | | | | | | |
| Normal | 111(32.2) | 14(19.4) | 4.69 | 0.03 | 128(31.1) | 3(18.8) | 1.05 | 0.41 |
| Substantial increased risk(>0.90cm) | 234(67.8) | 58(80.6) | | | 283(68.9) | 13(81.2) | | |
| Tobacco | | | | | | | | |
| No | 312(90.4) | 60(83.3) | 3.12 | 0.07 | 368(89.5) | 15(93.8) | 0.33 | 0.54 |
| Yes | 33(9.6) | 12(16.7) | | | 43(10.5) | 1(6.2) | | |
| Alcohol | | | | | | | | |
| No | 290(84.1) | 49(68.1) | 10.02 | 0.00 | 327(79.6) | 15(93.8) | 1.39 | 0.21 |
| Yes | 55(15.9) | 23(31.9) | | | 84(20.4) | 1(6.2) | | |
| Diet | | | | | | | | |
| Vegetarian | 161(46) | 31(43.1) | 0.31 | 0.57 | 185(45) | 7(43.8) | 0.01 | 0.92 |
| Non-vegetarian | 184(53.3) | 41(56.9) | | | 226(55) | 9(56.2) | | |
| Family history of DM | | | | | | | | |
| No | 199(57.7) | 44(61.1) | 2.30 | 0.31 | 255(62) | 6(37.5) | 4.87 | 0.08 |
| Yes | 113(32.8) | 18(25) | | | 120(29.5) | 9(56.2) | | |
| Don't know | 33(9.6) | 10(13.9) | | | 36(8.8) | 1(6.2) | | |
| Family history of hypertension | | | | | | | | |
| No | 217(62.9) | 49(68.1) | 0.70 | 0.70 | 254(61.8) | 9(56.2) | 0.51 | 0.79 |
| Yes | 91(26.4) | 16(22.2) | | | 114(27.7) | 5(31.2) | | |
| Don't know | 37(10.7) | 7(9.7) | | | 43(10.5) | 2(12.5) | | |

The univariate analysis done across the categorical variable to identify the risk factors associated with hypertension and diabetes mellitus. The column percentage has been reported across the table. Both the chi-square statistic and p value has been reported in table 3 and 4. Wherever the expected cell count is less than 5% we have reported fisher exact test with p value. The factors like age, gender, marital status, waist and hip circumference ratio, employment type, work experience and alcohol were found to be associated with the hypertension, whereas age, caste, level of education, employment type and work experience were found associated with diabetes mellitus. The actual p-value has been reported in the Table 3 and 4.

Burden of the diseases based on the designation:

Out of the 502 study participants, the distribution of staff across Group A, B, C and D categories were 46(9.16%), 47(9.36%), 312(62.15%) and 97(19.32%), respectively. The percentage of Diabetes and Hypertension in newly screened individuals were found to be high among the group C(62.5% and 53.2%) followed by group D(18.8% and 17%), Group A(12.5% & 7.5) and Group B(6.2% &10.3%). We did not find any association with Job designation across DM and HTN.

Work place Stressors: The results of the workplace stressors included designation of the employee, experience, working hours, work pattern, travel type & time and evaluation of work, emotional environment and evaluation of work/ discrimination. 69% of the employees were working in a permanent position and 62% of them belonged to C-Group. (Table 1) About 43% of them had work experience of >10years and 58% of them had sedentary type of work. Regarding number of hours worked, 72% of them worked 6 hours per day and about 60% of them

carry the work beyond the working hours. However, this has not shown any significant association with Diabetes and Hypertension. Regarding travel as a stressor, it was observed that majority (63.7%) of the workers took bus to office. Possibly, this could be due to most of them belonging to middle class family and 69% acknowledge that there is travel stress. Stress in any aspect can be one of the contributors for hypertension. About 70% of the participants were satisfied with their salaries and close to 90% are satisfied about their jobs. In DHFWS, majority of the participants acknowledged that they have the support of their colleagues and that work stress is not very high. Majority of the participants indicated that there are a lot of positives at the workplace. Their work seems to be recognized (71.7%), there is less difficulty in their job, adequate support from their team members (80.7%), no workplace abuse and no discrimination at workplace expressed by 90.8% of the staff, indicating an overall positive work environment. **(Supplementary Table 1)**

Discussion

The workforce in the health department is entrusted with the mandate of assuring health to all citizens. However, the assessment of health status of this workforce is done infrequently and very little is known about their health status and practices. Our results showed substantial proportion of the participants have diabetes and hypertension in DHFWS. The prevalence of diabetes in our study was 18% and this is in conformity with evidence from different states of India, which report the prevalence in the range of 10-21%. (17-19)The estimated prevalence of hypertension in our study was 31% which is higher than WHO estimates for India of 23%(20). A systematic review conducted to report prevalence of hypertension among Indian

patients found about 33% urban Indians are hypertensive (21). Diabetes and Hypertension form the deadly duo affecting India's urban population above the age of 30 years (17).

There is limited evidence regarding the burden of NCDs in different workforces. A study done in employees of Bangalore Metropolitan Transport Corporation (BMTC) aged between 30-50 years reported that 14% of them had hypertension.(22).A study among the employees of a mega industry in Gujarat exhibited prevalence of hypertension of 24.1% (23). In another study in software professionals, in the age group of 19-55 years , reported prevalence of hypertension was 31% it should be noted that 93% of this study population was below the age of 35 years (13), while a study of class D workers of Bangalore City Corporation, reported the prevalence of hypertension was 19% (24). In comparison with other estimates from Government employees and a study of school teachers in the age range of 19 to 65 years showed that 34% were obese and 35.3% were diabetic (25). However, to our knowledge, this is the first attempt to study the prevalence of diabetes and hypertension in the professionals working in any department of health and family welfare in India.

We have found majority of the individuals were overweight and high proportion of them were practicing physical activity. Similar results were shown by a study conducted among working population aged 18 years and above depicted physically active individuals with 51%, overweight (31.3%), obese (6%), hypertensive and diabetic (5.8%) (26). Higher proportion of males was found to be hypertensives compared to females. Such types of results were observed in other Indian studies too (27).

The study found factors like age, gender, marital status, waist and hip circumference ratio, employment type, work experience and alcohol to be associated with the hypertension. Lifestyle changes (harmful dietary practices and sedentary habits) occurring because of rapid urbanization and economic progress in urban areas has also contributed to the growing epidemic of hypertension. Major behavioral risk factors and association with non-communicable diseases among males were found to be alcohol consumption and smoking in many Indian studies (28).

Age, caste, level of education, employment type and work experience were found associated with diabetes mellitus.

Our study reports higher proportion of Group C having both the diseases, followed by Group D, A, B respectively. It is therefore important to ensure that regular diabetes checkup is included as part of the clinic visit so that early detection of diabetes cases could be made easier. The workforce in the health department is entrusted with the mandate of assuring health to all citizens. The poor awareness regarding NCDs in the directorate should result in some innovative ways of spreading the awareness.

Our study also examined whether various work place stressors had any impact on diabetes and hypertension. Overall, the prevalence of work place stressors was low among the DHFWS employees. We didn't find any significant association of workplace stressor with NCDs in DHFWS employees. As presented in the results, the employees indicated they had lower levels of stressors. A higher job control and favorable work-life balance might also be other reason. This is in contrast with results from recent meta-

analyses of observational studies indicating that job strain is associated with hypertension (29).

A major portion of the participants who were diagnosed of diabetes or hypertension reported that they comply with regular treatment. However, it was found during the survey that 30% participants had higher blood pressure and 40% had high glucose. This could probably mean that they were either not taking treatment regularly or did not have regular follow up. Majority of the employees were engaged in some form of physical activity with walking being the most favorite among majority of the participants. It was also noted that the diagnoses of diabetes or hypertension was done in the majority of the employees in the last four years and this could be one of the reason of many employees engaging themselves in physical activity.

The strengths of our study include sufficiently large sample comprising of most of the staff members of DHFWS and studying both diabetes and hypertension in the sample. Findings of the study has important public health implications, as it provides current burden on hypertension, T2DM, obesity and the risk factors involved among this working population and hence it guides to policy interventions. Our study has some weaknesses. First, the cross-sectional nature of our study precludes from any causal inference. Regarding lifestyle factors, majority of employees reported low proportion of alcohol consumption and tobacco usage. This can be due to social desirability bias. Despite being assured that the confidentiality of data will be maintained, there could be some hesitation to provide the correct response. All the available staff members of the health directorate were included in the study and therefore amounts to a census of all the available staff (30).

Conclusions

Routine screening and medical check-up programs are recommended to identify the risk category and timely intervention. Large-scale epidemiological studies need to be undertaken to further ascertain the overall prevalence of diabetes mellitus and hypertension in varied professions.

Ethics and dissemination: The institutional review board at IIPH, Bangalore, Public Health Foundation of India has approved the protocol. All participants are required to provide written informed consent.

Source(s) of support: The study received no support or grant

Acknowledgements: I would like to acknowledge and thank Dr. Gayathri, Medical officer and Mr. Chandru for their assistance in the survey. I would also like to extend my thanks to Mr. Nagesh for printing the booklets on Diabetes & Hypertension. We are also indebted to Mr. ShanthaKumar and Mr. T.S. Ramesh for assisting in data analysis and Mrs. Manjula for the conduct of the study. We thank Mr. Kirankumar HN for assisting in formatting the manuscript.

Presentation at a meeting: None

Conflict of Interest : No conflicts of interest

Contributor statement: PD was involved in the conception and design, drafting the article. SN was responsible for drafting the article revising it critically for important intellectual content. PS was involved in data validation and statistical analysis. DR was involved in drafting the article and revising it. YA was involved in drafting the article and revising it. GRB was involved in the supervision of conception and design, drafting the article and revising it critically for important

intellectual content and final approval of the version to be published. The manuscript has been read and approved by all the authors and each author believes that the manuscript represents honest work.

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Supplementary Table: Workplace stressors in the staff of DHFWS, Karnataka.

| Stressors | | Frequency | Percent |
|---------------------------------|--------------------|-----------|---------|
| Work Experience | Greater than 10 | 218 | 43.3 |
| | Less than 10 | 284 | 56.4 |
| Work hours per day | 4 Hours | 14 | 2.78 |
| | 5 Hours | 126 | 25.09 |
| | 6 Hours | 362 | 72.11 |
| Carry work beyond working Hours | Yes | 305 | 60 |
| | No | 197 | 40 |
| Type of work | Sedentary | 295 | 58 |
| | Field | 35 | 6 |
| | Both | 174 | 34.5 |
| Work Monitored | No | 55 | 11 |
| | Yes | 440 | 88.9 |
| Monitoring Frequency | Weekly | 210 | 52.4 |
| | Monthly | 166 | 41.4 |
| | Yearly | 25 | 6.2 |
| Evaluating Officer | Head of the Office | 338 | 84.3 |
| | Drawing Officer | 63 | 15.7 |
| Support at work place | No | 97 | 19.3 |
| | Yes | 405 | 80.7 |
| Work Recognition | No | 142 | 28.3 |
| | Yes | 360 | 71.7 |
| Difficulty in work | No | 395 | 78.7 |
| | Yes | 107 | 21.3 |
| Frequency of Difficulty | Rarely | 26 | 5.2 |
| | Occasionally | 56 | 11.2 |
| | Frequently | 25 | 5.0 |
| Help got during difficulty | No | 22 | 4.4 |
| | Yes | 85 | 16.9 |
| Abuses faced at work place | No | 426 | 84.9 |
| | Yes | 76 | 15.1 |
| Discrimination faced | No | 456 | 90.8 |
| | Gender | 4 | 0.8 |
| | Caste | 17 | 3.4 |
| | Language | 25 | 5.0 |
| Compared with colleagues | No | 436 | 86.9 |
| | Yes | 66 | 13.1 |

| | | | |
|---------------------------|----------------------|-----|-------|
| Travel Type | Govt. Vehicle | 28 | 5.58 |
| | Own Car | 12 | 2.39 |
| | Own 2wheeler | 124 | 24.70 |
| | Public Transport Bus | 320 | 63.75 |
| | Auto | 11 | 2.19 |
| | Walk | 5 | 1.00 |
| | Bi-cycle | 2 | 0.40 |
| Travel Stress | No | 153 | 31% |
| | Yes | 350 | 69% |
| Satisfied with salary | No | 150 | 30 |
| | Yes | 352 | 70 |
| Satisfied with Job | No | 40 | 8.1 |
| | Yes | 450 | 91.1 |
| Good seating arrangement | No | 162 | 32.3 |
| | Yes | 340 | 67.7 |
| Ventilation at work place | Insufficient | 181 | 36.1 |
| | Sufficient | 321 | 63.9 |
| Lighting at work place | Insufficient | 102 | 20.3 |
| | Sufficient | 400 | 79.7 |

Supplementary Table 2: Categorization of the staff of Health Directorate

Job categories, divided as per the various cadres of government job designations and titles.

| Sl.No. | Group | Designation |
|--------|-------|--|
| 1 | A | Commissioner, Director, Chief Administrative Officer, Chief Accounts Officer, Project Director, Additional Director, Joint Director, Deputy Director, Research Officer, Medical Officer, Training Officer, Senior Specialist, Administrative Officer, Transport Officer, Demographer, Consultant |
| 2 | B | Technical Officer, Assistant Administrative Officer, Health Equipment officer, District Health Education Officer, Service Engineer, Assistant Leprosy Officer, Graduate Pharmacist, Program Assistant |
| 3 | C | First Division Assistant, Second Division Assistant, Typist, Deputy District Health Education Officer, Stenographer, Driver, Lab Technician, Office Superintendent, Skilled Assistant, Junior Health assistant, Pharmacist, Librarian Grade II, Home Science Assistant, Computer Operator |
| 4 | D | Daffedar/Jamedar, Attender, Assistant binder, Watchman, Cleaner, Sanitary Worker, Carpenter, Insect Collector, Sweeper, Peon, Office Assistant, House Keeping, Security |