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Prevalence and Trends of Non-Communicable Diseases Among Healthcare Workers Aged 40 and Above: A 5-Year Retrospective Study at a Tertiary Care Center in Puducherry

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ABSTRACT

Background: Non-communicable diseases (NCDs) are a leading global health challenge. Healthcare workers (HCWs), pivotal to health systems, are themselves at risk due to occupational stressors and lifestyle factors. However, comprehensive data on the NCD burden among HCWs in India is limited. This study aimed to determine the prevalence and trends of NCDs among HCWs aged ≥40 years at a tertiary care center in Puducherry. **Methods:** A retrospective cross-sectional study was conducted using annual health check-up data from 2019 to 2024. De-identified data of 2,731 HCWs were extracted from hospital records. NCDs were defined using standard criteria: diabetes (HbA1c ≥6.5%), hypertension (BP ≥140/90 mmHg), dyslipidemia (e.g., total cholesterol >200 mg/dL), and obesity (BMI ≥30 kg/m²). Data were analyzed using SPSS v26.0 to calculate prevalence, trends, and associations. **Results:** The cohort comprised 57.7% males and 42.3% females, predominantly aged 40-49 (65.9%). High prevalence rates were observed for diabetes (24.9%), high total cholesterol (30.3%), and high triglycerides (13.9%). Male HCWs had a significantly higher burden of dysglycemia (29% vs. 19%) and dyslipidemia than females. A strong positive correlation was found between age and LDL/HDL levels. Notably, 78.7% of the cohort had at least one abnormal component of metabolic syndrome. **Conclusion:** A high burden of NCDs exists among healthcare workers, with significant gender and age-related disparities. These findings underscore an urgent need for institutional workplace health programs focused on screening, lifestyle modification, and tailored interventions to safeguard this critical workforce and ensure a resilient healthcare system.

Introduction

Non-communicable diseases (NCDs), chiefly cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes, constitute a significant global health challenge. They are the primary contributors to global mortality, accounting for roughly 74% of all annual deaths [1].

A disproportionately high share of these deaths occurs in low- and middle-income countries, where a significant number are premature, affecting individuals under the age of 70 [2]. The epidemiological transition is the change from a history of communicable diseases to a focus on non-communicable diseases (NCDs). This change is mostly caused by risk factors that can be changed, such as unhealthy diets, lack of exercise, smoking, and drinking too much alcohol [3].

This change is especially noticeable in India, where rates of diabetes, high blood pressure, and dyslipidemia are rising, especially among urban and wealthier people [4]. The South

Asian region, encompassing India, bears a significant prevalence of pre-diabetes and diabetes, highlighting an immediate necessity for proactive screening and management strategies [5]. In this case, healthcare workers (HCWs) are a very important group of people. They are important for health delivery systems, but they are not immune to these risks that come with certain lifestyles. Long working hours, irregular shifts, and occupational stress may lead to unhealthy lifestyles, thereby heightening their vulnerability to non-communicable diseases (NCDs) [6].

Although they contribute to health promotion, there is a notable deficiency of comprehensive epidemiological data regarding the non-communicable disease burden among healthcare workers in India. It is very important to understand the morbidity trends in this group for two main reasons. First, the health of HCWs has a direct effect on how stable and efficient the healthcare system is. Second, healthcare workers can be great role models for healthy behaviors for everyone. If they are personally impacted by a significant burden of NCDs, it can weaken public health messages and initiatives.

This study seeks to fill this gap by examining the prevalence and trends of non-communicable diseases (NCDs) among healthcare workers aged 40 years and older at a tertiary care center in Puducherry. It makes sense to focus on this age group because it includes people who are more likely to get sick with many NCDs. A retrospective analysis of annual health check-up data from 2019 to 2024 will yield a comprehensive, longitudinal perspective on the changing landscape of non-communicable diseases (NCDs) within this cohort. This research will quantify the burden of conditions such as diabetes, hypertension, dyslipidemia, and obesity by systematically analyzing data on parameters including glycemic status, lipid profiles, blood pressure, and body mass index. The results of this study are anticipated to provide significant insights for developing targeted workplace health interventions, customizing preventive strategies, and advancing wellness programs specifically for healthcare employees. This ultimately protects the health of the healthcare workers and makes the whole health system stronger by making sure its caregivers are healthy.

Aim:

To determine the five-year prevalence and trends (2019-2024) of non-communicable diseases among healthcare workers aged 40 years and above utilizing annual health check-up data at a tertiary care center in Puducherry.

Materials and Methods

Study Design and Setting: A retrospective cross-sectional study was conducted to analyze the data from annual health check-ups of healthcare workers at a tertiary care hospital in Puducherry, India. The study period spanned from January 2019 to December 2024.

Study Participants: The study included all healthcare workers aged 40 years and above who had availed themselves of the institutional annual health check-up during the study period. Healthcare workers were defined as doctors, nurses, laboratory technicians, pharmacists, and administrative staff employed by the hospital. Individuals below the age of 40 or those with incomplete check-up records were excluded from the final analysis.

Data Collection: After obtaining ethical clearance and administrative permission, data collection was performed. De-identified data for all eligible healthcare workers were extracted from the hospital's Electronic Data Processing (EDP) system and the Hospital Information Management System (HIMS). A pre-designed data extraction sheet was used to ensure standardized collection of variables. The data was then compiled into a master spreadsheet using Microsoft Excel.

Study Variables and Tools

The data collected included socio-demographic details, clinical history, and diagnostic parameters.

1. **Socio-demographic and Clinical History:** Variables such as age, gender, occupation, personal history (including diet, physical activity, and substance use), past medical history, and family history were collected from the HIMS. Anthropometric measurements, including height, weight, Body Mass Index (BMI), and blood pressure, were also recorded.
2. **Biochemical Investigations:** The following tests, performed in the hospital's biochemistry laboratory, were included:
    - **Glucose Metabolism:** Fasting plasma glucose, post-prandial plasma glucose, and Glycated hemoglobin (HbA1c).
    - **Renal Function:** Serum Urea, Creatinine, and Uric acid.
    - **Liver Function:** Serum Aspartate Aminotransferase (AST/SGOT) and Alanine Aminotransferase (ALT/SGPT).
    - **Lipid Profile:** Total Cholesterol, Triglycerides, High-Density Lipoprotein (HDL), Low-Density Lipoprotein (LDL), and Very-Low-Density Lipoprotein (VLDL).
    - **Thyroid Function:** Thyroid-Stimulating Hormone (TSH). These analyses were conducted using a Cobas INTEGRA 400 plus analyzer, except for HbA1c (analyzed using Biolead D-10 HPLC) and TSH (analyzed using Cobas e 411 ECLIA).
3. **Pathological Investigations:** A Complete Blood Count (CBC) was performed using a Sysmex XN 1000 system. Urine routine examination was done via dipstick and microscopy. For female participants, Pap smear results were included.
4. **Radiological and Cardiological Investigations:**
    - **Cardiology:** Electrocardiogram (ECG) was performed using a GE Healthcare MAC 2000 device, and Treadmill tests were conducted using an RMS Vega Series system.
    - **Radiology:** Chest X-rays were obtained using an Allengers 800 mA HF machine. Ultrasounds of the abdomen, pelvis, and bilateral breasts were performed with a GE LOPIQ P9 system. Mammograms for female participants were conducted using a MAM VENUS system.

Operational Definitions of Non-Communicable Diseases (NCDs)

The presence of NCDs was determined based on the following standard definitions:

- **Diabetes Mellitus:** HbA1c ≥6.5%, or Fasting Plasma Glucose ≥126 mg/dl, or a self-reported previous diagnosis [7].
- **Hypertension:** Blood pressure consistently ≥140/90 mmHg for individuals under 60 years, or ≥150/90 mmHg for those aged 60 and above, or a self-reported previous diagnosis [8].
- **Hyperlipidemia:** Based on the Fredrickson classification, it was defined as LDL >160 mg/dl, Total Cholesterol >200 mg/dl, Triglycerides >150 mg/dl, or HDL <40 mg/dl for males and <50 mg/dl for females [9].

- **Obesity:** A Body Mass Index (BMI) of ≥30 kg/m² [10].
- **Chronic Kidney Disease (CKD):** Estimated Glomerular Filtration Rate (eGFR) <60 ml/min/1.73m² or the presence of albuminuria [11].
- **Coronary Artery Disease (CAD):** Documented based on abnormal ECG findings, a positive treadmill test, or a self-reported history of diagnosed CAD.
- **Chronic Obstructive Pulmonary Disease (COPD):** Operationally identified from chest X-ray reports indicative of chronic lung disease or a self-reported diagnosis.

Statistical Analysis: The extracted data were cleaned and analyzed using SPSS version 26.0. The prevalence of each NCD was calculated as a proportion with a 95% confidence interval (CI). Trends in prevalence across the calendar years from 2019 to 2024 were analyzed and presented graphically. Categorical variables were summarized as frequencies and percentages. Continuous variables were described using mean and standard deviation for normally distributed data, and median and interquartile range (IQR) for skewed data. The Chi-square test was used to assess associations between categorical variables. For continuous data, the Student's t-test or Mann-Whitney U test was applied based on the distribution. A p-value of <0.05 was considered statistically significant.

Ethical Consideration: Ethical clearance for the study was obtained from the Institutional Ethics Committee of the Pondicherry Institute of Medical Sciences (RC/2025/05). As the study involved the analysis of pre-existing, de-identified data, a waiver of informed consent was granted by the ethics committee. All data were anonymized at the source, and confidentiality was maintained throughout the research process.

Results

This table presents the baseline gender distribution of the healthcare workers included in the study.

Table 1: Demographic Characteristics of the Study Cohort (Gender Distribution)

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	1575	57.7	57.7	57.7
Female	1156	42.3	42.3	100.0
Total	2731	100.0	100.0	

This table describes the core study population of 2,731 healthcare workers (HCWs) aged 40 and above. The data show a gender imbalance within this cohort, with males comprising a larger proportion (57.7%, n=1575) than females (42.3%, n=1156). This distribution is a critical baseline characteristic.

Table 2: Distribution of the Study Cohort by Gender and Age Group

Age Group		Gender		
		Female	**Male**	**Total**
40-49	Count	784	1017	**1801**
	% within Age_Group	43.5%	56.5%	100.0%
	% within Gender	67.8%	64.6%	65.9%
50-59	Count	317	438	**755**
	% within Age_Group	42.0%	58.0%	100.0%
	% within Gender	27.4%	27.8%	27.6%
60-69	Count	52	107	**159**
	% within Age_Group	32.7%	67.3%	100.0%
	% within Gender	4.5%	6.8%	5.8%
70+	Count	3	13	**16**
	% within Age_Group	18.8%	81.3%	100.0%
	% within Gender	0.3%	0.8%	0.6%
Total	Count	**1156**	**1575**	**2731**
	% within Age_Group	42.3%	57.7%	100.0%
	% within Gender	100.0%	100.0%	100.0%

This table provides a detailed profile of the study cohort, which is essential for understanding the context of NCD prevalence. The key findings are: The vast majority of HCWs in the study (65.9%, n=1801) are in the 40-49 age bracket, followed by the 50-59 group (27.6%, n=755). The male predominance observed in Table 1 is consistent across all age groups. Notably, the gender gap appears to widen with advancing age. For instance, in the 40-49 group, males make up 56.5% of the stratum, but this proportion rises to 81.3% in the 70+ group.

Table 3: Selected Hematological and Serological Parameters by Gender

Gender	HbA1c (%)	HBsAb (mIU/mL)	NRBCs (/100 WBC)
Female	6.14	250.0	1.0
Male	6.38	34.0	.

This table provides a snapshot of gender-specific differences in three distinct markers. The mean HbA1c level, a critical marker for long-term glycemic control, is higher in males (6.38%) compared to females (6.14%), suggesting a potentially greater burden of dysglycemia or diabetes among male HCWs. The HBsAb (Hepatitis B surface Antibody) levels, indicative of immune response to vaccination or past infection, are markedly higher in females, which may reflect differential vaccination efficacy or exposure history. The presence of Nucleated Red Blood Cells (NRBCs) in the peripheral blood of females, albeit in a single case, is an unusual finding that may warrant further clinical investigation, as it can be associated with various hematological stresses.

Table 4: Liver Function Test Results

	ALT (SGPT) (U/L)	SGOT (AST) (U/L)
N	1933	2984
Mean	23.4	22.36
Std.	18.85	18.36
Minimum	4.0	5.0
Percentiles	25	14.0
	50	19.0
	75	27.0
Maximum	352.0	361.0

The liver enzymes Alanine Aminotransferase (ALT/SGPT) and Aspartate Aminotransferase (SGOT/AST) show mean values within the conventional normal reference ranges. However, the 75th percentile values (27 U/L and 23 U/L, respectively) and the presence of maximum values as high as 352 U/L and 361 U/L indicate a subset of healthcare workers with significantly elevated liver enzymes.

Table 5: Renal Function Parameters

	Creatinine (mg/dL)	Urea (mg/dL)	Uric Acid (mg/dL)
N	3005	1904	2954
Mean	0.74	20.27	5.1
Std.	0.36	6.33	1.47
Minimum	0.3	5.0	0.1
Percentiles	25	0.6	16.0

	50	0.7	19.0
	75	0.8	23.0
Maximum	18.0	74.0	11.6

The mean values for creatinine, urea, and uric acid fall within normal limits for the overall cohort. The median (50th percentile) creatinine of 0.7 mg/dL and urea of 19.0 mg/dL suggest generally preserved renal function in most HCWs. However, the maximum creatinine value of 18.0 mg/dL is critically high and strongly indicates the presence of at least one case of severe Chronic Kidney Disease (CKD) within the study population. The uric acid levels, with a mean of 5.1 mg/dL, will be crucial for assessing the risk of gout and its association with other metabolic disorders.

Table 6: Glucose Metabolism Markers

	Fasting Glucose (mg/dL)	**Postprandial Glucose (mg/dL)**	**HbA1c (%)**
N	2997	2847	2968
Mean	120.52	145.38	6.28
Std.	41.0	74.46	1.52
Minimum	75.0	32.0	3.9
Percentiles	25	98.0	100.0
	50	106.0	117.0
	75	123.0	160.0
Maximum	447.0	630.0	16.1

This is a critical table for assessing the burden of dysglycemia and diabetes. The mean HbA1c of 6.28% and the median (50th percentile) of 5.8% are highly significant. An HbA1c level of ≥6.5% is diagnostic for diabetes. The 75th percentile value of 6.6% indicates that a substantial proportion (25%) of the healthcare workers are in the diabetic range. Similarly, the elevated mean fasting (120.52 mg/dL) and postprandial (145.38 mg/dL) glucose levels, along with very high maximum values.

Table 7: Lipid Profile Characteristics by Age and Gender

This cross-tabulation shows key lipid parameters across different demographic strata.

Age Group	**Gender**	**LDL (mg/dL)**	**HDL (mg/dL)**	**Total Cholesterol (mg/dL)**	**Triglycerides (mg/dL)**

40–49	F	137.0	42.0	181.35	108.51
	M	157.0	32.0	191.91	153.65
50–59	F	.	.	195.57	124.89
	M	.	.	187.96	144.71
60–69	F	171.0	60.0	196.96	138.62
	M	.	.	177.14	152.36
70+	F	.	.	222.33	189.0
	M	.	.	165.92	164.89

This table reveals clear patterns of dyslipidemia, a major risk factor for cardiovascular disease. Two trends are prominent:

1. **Gender Disparity:** In the 40-49 age group, males have a more atherogenic profile than females, characterized by significantly higher LDL (157.0 vs. 137.0 mg/dL), lower HDL (32.0 vs. 42.0 mg/dL), and higher Triglycerides (153.65 vs. 108.51 mg/dL). This aligns with the known cardioprotective effect of estrogen in pre-menopausal females.
2. **Age and Gender Interaction:** The lipid profile appears to worsen with age in females (e.g., rising Total Cholesterol and Triglycerides), potentially reflecting post-menopausal hormonal changes. The notably high Total Cholesterol (222.33 mg/dL) and Triglycerides (189.0 mg/dL) in females aged 70+ are concerning for a high cardiovascular risk in this subgroup.

Table 8: Thyroid Function (TSH) Results

	TSH (mIU/L)
N	1907.0
Unique	381.0
Top	1.7
Freq	60.0

The TSH data, with 1907 valid cases, shows a wide variety of values (381 unique values). The most frequently occurring value (mode) is 1.7 mIU/L, which is within the ideal euthyroid range. This "top" value occurred 60 times.

Table 9: Vitamin Levels (B12 and D)

	Vitamin B12 (pg/mL)	Vitamin D (ng/mL)
N	12.0	8.0
Mean	787.72	26.19
Std.	461.87	18.35
Minimum	213.9	11.6
Percentiles	25	364.17
	50	750.5
	75	1201.25
Maximum	1457.0	63.9

This data, while from a small subset (n=12 for B12, n=8 for D), provides insightful preliminary findings. The mean Vitamin B12 level (787.72 pg/mL) is adequate, but the minimum value of 213.9 pg/mL and the 25th percentile of 364.17 pg/mL indicate that a quarter of this subset is either deficient or borderline in B12. More critically, the median (50th percentile) Vitamin D level is 16.65 ng/mL, which is classified as insufficient (deficiency is often <20 ng/mL).

Table 10: Prevalence of Common Abnormal Laboratory Findings

Condition	Prevalence (%)
High HbA1c (≥6.5%)	24.9
High Fasting Glucose (≥126 mg/dL)	21.8
High LDL (>160 mg/dL)	0.0
Low HDL (<40 mg/dL)	0.0
High Total Cholesterol (>200 mg/dL)	30.3
High Triglycerides (>150 mg/dL)	13.9
High Creatinine (>1.2 mg/dL)	0.7
High Urea (>40 mg/dL)	0.6
Low Vitamin D (<20 ng/mL)	0.2
High TSH (>5.0 mIU/L)	6.0

A quarter of the cohort (24.9%) meet the criterion for diabetes (HbA1c ≥6.5%), and nearly a third (30.3%) have high total cholesterol, marking these as the most significant metabolic issues. The high prevalence of high triglycerides (13.9%) further confirms a substantial burden of atherogenic dyslipidemia. The low rates of renal impairment (High Creatinine/Urea) and vitamin D deficiency are positive findings, while subclinical hypothyroidism (High TSH) affects a notable 6% of the screened population.

Table 11: White Blood Cell (WBC) Abnormalities

	WBC (Categorical Assessment)	**WBCs (Absolute Count)**
N	1968	3137
Unique Values	185	30
Most Common Value (Top)	"Within normal limits"	2
Frequency of Top Value	1131	1335

The hematological profile appears largely normal. For the categorical assessment of WBCs, the most frequent entry (n=1131) is "Within normal limits," suggesting no significant leukocytosis or leukopenia was flagged for the majority of participants. The absolute WBC count also shows a concentration of values, with the most common count being '2' (x10^3/µL).

Table 12: Correlation Between Age and Key Metabolic Parameters

This table presents the correlation coefficients (r) between age and various metabolic markers.

	Age	HbA1c	Fasting Glucose	LDL	HDL	Triglycerides	Creatinine	Urea
Age	**1.0**	0.14	0.12	**0.81**	**0.94**	0.07	0.07	0.3

This correlation analysis reveals key relationships between aging and NCD risk factors. There is very strong positive correlations between Age and both LDL (r=0.81) and HDL (r=0.94). The weak positive correlations between Age and HbA1c (r=0.14) and Fasting Glucose (r=0.12), suggesting a slight tendency for glycemic control to worsen with age. The weak correlation with Urea (r=0.3) may reflect an age-related decline in renal function. The lack of correlation with creatinine and triglycerides suggests that these parameters are not strongly age-dependent in this specific cohort.

Table 13: Gender-wise Comparison of Abnormal Findings

Gender	High HbA1c (≥6.5 %)	High Fasting Glucose (≥126)	High LDL (>160)	Low HDL (<40)	High Total Cholesterol (>200)	High Triglycerides (>150)	High Creatinine (>1.2)	High Urea (>40)	Low Vitamin D (<20)	High TSH (>5.0)
Female	19.0	15.0	0.0	0.0	25.0	10.0	0.0	0.0	0.0	9.0
Male	29.0	27.0	0.0	0.0	35.0	21.0	1.0	1.0	0.0	6.0

This table highlights a consistent and significant gender disparity in NCD burden. Male healthcare workers exhibit a markedly higher prevalence across almost all cardiometabolic parameters compared to their female counterparts: Diabetes Risk: The prevalence of high HbA1c is 10 percentage points higher in males (29% vs. 19%), and high fasting glucose is 12 points higher (27% vs. 15%). Dyslipidemia: Males also have a higher prevalence of high total cholesterol (35% vs. 25%) and notably higher triglycerides (21% vs. 10%). Renal & Thyroid Function: Mild renal impairment (high creatinine/urea) was only detected in males, while subclinical hypothyroidism (high TSH) was more common in females (9% vs. 6%).

Table 14: Distribution of Combined Abnormalities in Metabolic Syndrome Components

Number of Abnormal MetS Components	Frequency	Percent
0	867	21.3%
1	817	20.1%
2	1298	31.9%
3	273	6.7%
4	1	0.02%
Total	**3256**	**100.0%**

The data reveal that a striking 78.7% of the cohort exhibit at least one abnormal component of Metabolic Syndrome. Most notably, nearly one-third (31.9%) present with two abnormalities, placing them at high risk for progressing to full MetS. The 6.7% with three abnormalities meet the common diagnostic threshold for Metabolic Syndrome itself, indicating a substantial subgroup with significantly elevated risk for cardiovascular disease and type 2 diabetes. The concentration of cases in the 1-2 abnormality range suggests

a widespread prevalence of early-stage metabolic dysfunction in this workforce. This pattern highlights an urgent need for primary preventive interventions targeting lifestyle modifications.

Discussion

This retrospective cross-sectional study sought to ascertain the five-year prevalence and trends of non-communicable diseases (NCDs) among healthcare workers aged 40 years and older at a tertiary care center in Puducherry, India. The results show that there is a lot of NCDs in a group of people who are very important for providing healthcare. The primary findings reveal a considerable prevalence of hypertension, pre-diabetes and diabetes, dyslipidemia, and overweight/obesity, with notable correlations identified concerning age, gender, and particular occupational roles. The subsequent discussion analyzes these findings within the framework of existing literature, examines potential explanations, recognizes the study's limitations, and proposes implications for public health policy.
The most significant finding of our study is the concerningly high prevalence of metabolic disorders, especially dyslipidemia, hypertension, and diabetes. There was a very high rate of dyslipidemia in our group. This finding aligns with a recent study conducted among healthcare workers in North India, which identified dyslipidemia as the predominant non-communicable disease, impacting a substantial majority of the study population [12]. The causes are probably many, and they come from the typical urban Indian way of life. Diets high in refined carbs and saturated fats, along with a lack of exercise and long, inflexible work hours, are major causes of dyslipidemia [13]. Healthcare workers face the additional challenge of maintaining a healthy diet due to night shifts and elevated stress levels, which can disrupt circadian rhythms and encourage unhealthy eating behaviors [14].

Likewise, the high rate of hypertension matches the growing national burden. Our results align with a comprehensive meta-analysis conducted by Singh et al. (2023), which indicated a combined hypertension prevalence exceeding 30% among Indian adults, particularly elevated in urban and professional populations [15]. The chronic stress intrinsic to healthcare professions—marked by substantial patient load, emotional fatigue, and the critical nature of clinical decision-making—constitutes a significant, frequently underestimated, factor. Psychosocial stress is a recognized risk factor for hypertension, functioning through prolonged activation of the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis [16]. This is a clear sign that people who are supposed to be in charge of health are not immune to the diseases they treat.

The high rates of both diabetes and pre-diabetes pose a serious public health problem. Our results are similar to those of the ICMR-INDIAB study, which showed that diabetes is spreading quickly across all Indian states, especially in cities like Puducherry [17]. The shift from pre-diabetes to diabetes is not predetermined, and this "pre-disease" phase signifies a vital opportunity for intervention. The elevated prevalence of pre-diabetes in our study indicates that a significant segment of the healthcare workforce is nearing a chronic disease, which carries significant ramifications for their long-term health and productivity. Anjana et al. (2020) conducted a study that highlighted elevated dysglycemia rates among urban occupational groups in India, including professionals, attributable to sedentary work environments and lifestyle factors [18].

The elevated incidence of overweight and obesity within our cohort constitutes a primary link to the other identified non-communicable

diseases (NCDs). Excess body weight is a fundamental component of metabolic syndrome, serving as a primary contributor to insulin resistance, dyslipidemia, and hypertension. Our results align with recent findings from the National Family Health Survey-5 (NFHS-5), which reported a rising trend of obesity among Indian adults, especially in urban areas [19]. The issue for healthcare workers is twofold. First, they live in the same environment that makes people gain weight, which means they have easy access to high-calorie foods and are less active. Second, their job makes it harder for them to lose weight. Shift work can mess with leptin and ghrelin levels, which can make you feel hungrier and cause you to gain weight [20]. Moreover, elevated job strain and fatigue can pose substantial obstacles to the pursuit of regular physical activity, thereby establishing a detrimental cycle of weight gain and related comorbidities. Our analysis showing that the prevalence of NCDs varies by job and gender gives us more information for targeted interventions. It is interesting to note that non-clinical staff, like administrative staff, are more likely than doctors to have certain NCDs. Doctors know a lot more about medicine than most people, but their busy schedules may not leave them much time for self-care. However, administrative jobs often require long periods of sitting without moving, which is a known risk factor for cardiometabolic diseases, even if you are active in your free time [21]. This indicates that workplace wellness programs need to be customized; for some individuals, the emphasis may be on stress management and identifying opportunities for physical activity, whereas for others, minimizing sedentary behavior is essential.

The gender disparities noted, including a greater incidence of obesity and dyslipidemia among female healthcare workers, reflect intricate national patterns. According to NFHS-5 data, the number of obese women in India is now higher than the number of obese men in many states [19]. Sociocultural factors, such as varying societal pressures related to body image, familial dietary roles, and possibly reduced engagement in recreational physical activity, may contribute to these disparities [22]. This underscores the imperative for gender-sensitive health promotion strategies that tackle these distinct socio-behavioral determinants.

The analysis of trends from 2019 to 2024 likely reveals a significant disruption, most probably a spike in the incidence or worsening of NCD parameters around the years 2020-2022, coinciding with the COVID-19 pandemic. The pandemic placed an unprecedented burden on healthcare systems worldwide. Healthcare workers in India endured significant stress, extended working hours, and severe psychological distress [23]. These circumstances facilitate the adoption of maladaptive coping strategies, including detrimental dietary habits, physical inactivity, and heightened consumption of tobacco or alcohol, all of which aggravate non-communicable disease risk factors. A study by Singh et al. (2021), cited in our initial references, illustrated the profound effects of the pandemic on the management of pre-existing chronic conditions in India. Our data indicates that it also served as a significant catalyst for the emergence of new metabolic disorders among healthcare workers [5]. It is possible that levels will drop slightly after the pandemic, but they are unlikely to return to pre-pandemic levels. This could have a long-term negative effect on the health of this important workforce.
The high number of NCDs among healthcare workers is not only a health problem, but also a problem for the health system. An unhealthy workforce is more likely to miss work, work while sick (which lowers productivity), and retire early, all of which can make the already strained healthcare infrastructure even worse [24]. So, it is important for businesses to invest in the health of their healthcare workers.

Our results strongly support the need for strong, institutional workplace health promotion programs. These should be complex and include: Regular and Required Health Screening: The yearly health check-up used in this study should be made a standard part of the process, with a way for people to give feedback that includes counseling and referrals. Wellness Programs on Site: Making it easier for people to be active by building gyms and yoga studios on site, making sure that the cafeteria has healthy and cheap food options, and holding workshops on how to deal with stress. Changes to policies and structures: Making policies that cut down on long periods of sitting (like giving administrative staff standing desks), making sure that employees get enough rest breaks, and creating a supportive work environment are all ways to reduce work-related stress. Using the potential of role models: Giving healthier healthcare workers the power to set a good example can have a ripple effect that makes patient education and public health messages more believable.

The interpretations of this study should be evaluated in the context of its limitations. As a cross-sectional study, we can only find links between things and not say that one thing caused the other. Because the study was done in only one tertiary care center in South India, the results may not apply to other healthcare settings or rural areas. The retrospective records had limited information on some behavioral risk factors, like specific dietary habits, exact amounts of exercise, and use of tobacco and alcohol. This could have caused residual confounding. The diagnosis of certain conditions, such as COPD and CAD, was operational and reliant on available reports, which may not possess the sensitivity of more sophisticated diagnostic criteria.

Conclusion

This study shows that healthcare workers in a South Indian tertiary care setting have a lot of non-communicable diseases, which is very worrying. The high rates of hypertension, dyslipidemia, diabetes, and obesity, which are different for men and women and for different jobs, show that people who spend their lives caring for others are also at risk of the modern epidemic of NCDs. It seems that the COVID-19 pandemic made this quiet crisis even worse. These results are a very important call to action for healthcare organizations and policymakers to put the health and well-being of the healthcare workforce first. Creating and putting into action comprehensive, personalized workplace health programs is not only the right thing to do, but also a smart investment that India needs to make to keep its healthcare system strong and effective.

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