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Titled

UNDERSTANDING "ABLING" BEHAVIORS FOR NON-COMMUNICABLE DISEASE SCREENING IN THE ORGANIZED SECTORS OF TAMIL NADU BY IPO MODEL

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EXECUTIVE SUMMARY

Introduction:

Non-communicable disease is the major public health program globally, with a steady increase in the past 10 years. India is experiencing a significant epidemiological transition due to industrialization, urbanization, and lifestyle changes. The contribution of NCDs to the overall disease burden in India has increased from 30% in 1990 to 55% in 2020, with NCD-related deaths rising from 37% to 61% during the same period. In response to the growing burden, India has adopted the "National Action Plan" aligned with the WHO Global Action Plan for NCD Prevention and Control, setting national targets to reduce premature mortality from NCDs by 25% by 2025.

NCDs, including hypertension, diabetes, and cancer, are largely influenced by lifestyle factors such as smoking, physical inactivity, unhealthy diets, and alcohol consumption. The Government of India has implemented several initiatives under the National Health Mission (NHM) and Ayushman Bharat—Health and Wellness Centers, focusing on screening for common NCDs among individuals aged 30 and above. However, despite the availability of these programs, utilization remains low, particularly among individuals in the organized sector.

Epidemiological data indicate that hypertension and diabetes prevalence are higher among individuals in urban areas and those belonging to higher wealth quintiles, which likely represents the organized sector workforce. The gap in screening participation highlights the need for further exploration of the facilitators and barriers influencing NCD screening behaviors in the organized sector.

This study aims to investigate the enabling and disabling factors affecting NCD screening among employees in the organized sector. Understanding these factors will help develop targeted interventions to improve participation in screening programs, ultimately reducing the burden of NCDs in the workforce and contributing to improved health outcomes at both individual and population levels.

Objective of the study:

The primary aim of this study is to understand the behaviors, both enabling and disabling, related to screening for non-communicable diseases (NCDs) among the organized sector in Tamil Nadu, utilizing the IPO model.

The specific objectives are:

- To describe the enabling factors and disabling factors related to the implementation of worksite screening of hypertension and diabetes among organized sector in Tamil Nadu
- To assess the effectiveness of NCD screening programs by measuring their impact on employee health outcomes, including early detection rates.
- To develop actionable recommendations to improve the design, implementation, and management of NCD screening programs within the organized sector.

Study design:

Mixed methodology. In-depth interviews (IDIs) and key informant interviews (KIIs) with different stakeholders were done to get insights on the barriers and enablers of the organization. A semi-structured, quantitative study was done to assess the magnitude of each factor associated with screening and outputs achieved through the screening program.

Method:

For the qualitative part, purposeful sampling was used to make sure that the people who are in charge of implementing NCD screening in the workplace were included. Key industry stakeholders and healthcare providers were chosen for this purpose. Industry stakeholders include HR managers, workplace safety officers, healthcare providers, and employee representatives. Government health providers include district NCD program coordinators, industry safety officers, block medical officers, and primary healthcare staff. The qualitative sample consists of 150 industry stakeholders and 25 government health providers, totaling 175 participants across selected districts.

For the quantitative component, a stratified random sampling approach was adopted, selecting industries from four geographic zones. Employees aged 18 years and above who had been working for more than six months in the selected industries were eligible to participate. The final sample size was calculated using prevalence rates from NFHS-5 Tamil Nadu. A 15% non-response rate meant that 303 respondents were needed to reach statistical significance.

Key Findings of the Study

A total of 317 employees participated, with 262 undergoing workplace screening. Participation rates were lower among younger employees, emphasizing the need for targeted awareness. Among those diagnosed with diabetes, 44.1% were first detected at workplace screenings, and all study participants under the age of 35 with diabetes were first diagnosed in this setting. Similarly, among those diagnosed with hypertension, 51.7% were identified at the workplace, with 60% of the five participants under 35 first detected through workplace screening. Workplace screening programs also influenced lifestyle changes; 23.8% of the 295 respondents who had previously participated in such programs reported making some modifications to their lifestyle. Specifically, 93.3% of the 15 individuals diagnosed with diabetes at a workplace screening adopted lifestyle changes, while 60% of those diagnosed with hypertension did the same. A majority of respondents (81.4%) expressed willingness to participate in future non-communicable disease (NCD) screening programs, and 64.7% believed that the screenings positively impacted their overall health. Additionally, 86% of those diagnosed with either hypertension or diabetes at the workplace were satisfied with the screening process. Notably, employees working for companies highly supportive of health and wellness were 19.14 times more likely to participate in workplace screening programs compared to those in less supportive work environments.

Barriers to workplace NCD screening

Barriers were categorized into health system, industry, individual, and process-related challenges. Key issues included unclear guidelines, lack of official communication,

insufficient follow-up mechanisms, staff shortages, scheduling conflicts, and low awareness among employees. Concerns over stigma and discrimination, logistical difficulties, and poor communication further hindered participation.

Facilitators for successful screening

Strong organizational and policy support, such as management commitment, CSR initiatives, and structured screenings, improved participation. Healthcare system integration, including referral systems and collaboration with PHCs and ESI teams, ensured proper follow-ups. Employee engagement strategies, such as awareness campaigns, adaptive scheduling, and peer motivation programs, further boosted participation rates.

Adaptability and scalability

Non-communicable diseases (NCDs) like diabetes and hypertension impact workforce productivity, prompting the Tamil Nadu Health System Reform Program to introduce workplace NCD screening programs for early detection and intervention. These screenings enhance employee well-being, reduce absenteeism, and promote preventive healthcare. However, their success depends on adaptability—ensuring smooth implementation through industry collaboration, trained healthcare personnel, and awareness campaigns. Small industries face financial constraints, medium industries struggle with scheduling, and large industries encounter logistical hurdles. Strengthening partnerships, structured scheduling, and leadership support can improve participation and sustainability.

Scalability relies on strong health system coordination, industry collaboration, and digital health solutions like electronic records. Small industries need financial aid and mobile screening units, while medium industries benefit from cost-effective group screenings and telemedicine. Large industries can leverage centralized health monitoring and corporate wellness policies. Leadership-driven initiatives and digital engagement tools can sustain long-term participation. Addressing these challenges through structured planning and financial support can transform workplace screenings into a sustainable

health initiative, improving employee well-being and contributing to Tamil Nadu's economic and social development.

Conclusion

To maximize impact, workplace screenings must be part of a broader, continuous healthcare approach rather than isolated interventions. Strengthening referral systems, implementing structured follow-up mechanisms, and fostering collaboration between industries and healthcare providers are critical. Industries should integrate preventive healthcare into workplace culture through strong management support and employee education. A holistic, employee-centered strategy will enhance accessibility, improve long-term health outcomes, and ensure the sustainability of workplace NCD screenings.

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CHAPTER 1

INTRODUCTION

1.1 Background of the study

Industrialization, socio-economic development, urbanization, changing age structure, and changing lifestyles have placed India in a position where it is facing a growing burden of non-communicable diseases. According to a report called “India: Health of the Nation’s States” by the Ministry of Health and Family Welfare (MoHFW), Government of India (GOI), noncommunicable diseases (NCDs) will cause 55% more disability-adjusted life years (DALYs) by 2020 than they did in 1990. They will also cause 37% more deaths among all deaths, up from 37% in 1990. This graph shows a rapid epidemiological transition with a shift in disease burden to NCDs (1). In response to the “WHO Global Action Plan for the Prevention and Control of NCDs 2013-2020,” India is the first country to adopt the National Action Plan with specific national targets and indicators aimed at reducing the number of global premature deaths from NCDs by 25% by 2025. The global action plan has suggested 9 targets for countries to set. As a WHO Member State, India is committed to implementing an appropriate action plan and taking necessary steps to meet the objectives of the global action plan as per the suggested timeline.

Non-communicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental, and behavioral factors (2). Lifestyle changes contribute to NCDs, with smoking, lack of physical activity, unhealthy diet, and alcohol consumption among the risk factors. These risk factors can cause physiological changes in the human body, such as increased blood pressure, increased blood sugar, increased blood cholesterol, and obesity (Siswanto& Lestari, 2020). A population-based initiative for prevention, control, and screening for common non-communicable diseases (NCDs), i.e., diabetes, hypertension, and common cancers, has been rolled out in the country under NHM and also as a part of Comprehensive Primary Health Care. Under the initiative, individuals more than 30 years of age are targeted for their screening for the common NCDs, in

which there is a focus on screening breast cancer and cervical cancer among women. Screening for these common NCDs is an integral part of service delivery under Ayushman Bharat – Health and Wellness Centers (2). Non-communicable diseases are a leading cause of morbidity and mortality worldwide because of the epidemiological transition over the last three decades, and health screenings are the most effective way to reduce the risk of developing a chronic disease (3–6). However, many individuals do not take advantage of health screening services for chronic diseases, especially in the organized sector of our country. Therefore, efforts to prevent and address NCDs (hypertension, diabetes mellitus, and hyperuricemia) and health screening through blood pressure, sugar level, and uric acid level checks must be taken (7). An effective method for NCD prevention is screening for NCD. Through this study, we propose to understand the “abling” (enabling and disabling) NCD screening behaviors.

Rationale

The prevalence of hypertension among individuals aged 15 and over is higher in men (24%) than women (21%). Pre-hypertension affects a larger proportion of men (49%) than women (39%). According to the NFHS-5 Report, the prevalence of hypertension is higher in urban areas (23.6% for women, 26.6% for men) compared to rural areas (20.2% for women, 22.7% for men) (8).

Interestingly, hypertension is more prevalent in the highest wealth quintile (24.9% for women, 29.7% for men) compared to the lowest wealth quintile (18.5% for women, 19.5% for men) (8). In terms of the Waist-to-Hip Ratio (WHR), a substantially increased risk is more common in urban areas compared to rural areas, both for women (60% in urban areas, 55% in rural areas) and men (50% in urban areas, 46% in rural areas) (8).

The prevalence of elevated random blood glucose levels (>140 mg/dl) is reported as 12% for women and 14% for men aged 15 and over (8). Women who have completed 12 or more years of education show a higher prevalence of diabetes (92.4%) compared to those with fewer years of education (8). Similarly, men with 12 or more years of education also have a higher prevalence of diabetes (87.5%) compared to those with fewer years (8). Individuals with higher levels of education, specifically those who have completed 12 or more years of education, are likely to be part of the organized sector.

India is home to more than 1.3 billion people, of which about 730 million are aged between 15 and 59 years (60%). Workers account for nearly 40% of India's population (537 million workers) and 65.4% of individuals aged between 15 and 59 years in India (9). The age group of 15-59 years is not only the productive section of the population but also the age where NCDs and NCD risk factors manifest and progress. These statistics indicate that the 'working population' is a priority group for NCD prevention and control in India. Conversely, it implies that reducing NCDs among workers holds the key to reducing the NCD burden in India. The working population in India bears a substantial burden of NCDs and mental health disorders. It emphasizes that workplace interventions are more feasible and relatively easier to implement and evaluate benefits in organized sector workplaces, which account for 8–10% of the workforce, to achieve national NCD targets and Sustainable Development Goals (10).

Further exploration is warranted to investigate the facilitators and barriers related to non-communicable disease screening in the context of the organized sector. This exploration can further help us understand the reasons behind the observed prevalence rates, identify the facilitators that encourage screening participation, and uncover the perceived barriers that hinder engagement.

1.2 Aim of the study

The aim of our study is to understand non-communicable disease screening behaviors, both enabling and disabling behaviors, among the organized sector in Tamil Nadu underpinned by the CFIR model.

1.3 Specific objectives

- To describe the enabling factors and disabling factors related to the implementation of worksite screening of hypertension and diabetes among organized sector in Tamil Nadu
- To assess the effectiveness of NCD screening programs by measuring their impact on employee health outcomes, including early detection rates.
- To develop actionable recommendations to improve the design, implementation, and management of NCD screening programs within the organized sector.

1.4 Literature review

A study by Tripathy on ‘Diabetes care in public health facilities in India’ (2020) conducted in six districts across three states in India reported on some of the barriers related to screening for diabetes. Screening was done by blood glucose testing using the strip method. Most of the participants in the study reported overcrowding, long waiting times and inadequate care as the major barriers to receiving preventive services, including screening at public health facilities (11).

Demaio et al. (2013) conducted a study in Mongolia on ‘Hypertension and hypertension-related disease’ and explored barriers to blood pressure screening. Almost half of the study participants rated a lack of self-perceived importance as the main barrier to screening uptake (47.8%). In addition, a lack of awareness of the need to be screened was reported as another major barrier. A lack of time was cited by 17.3% of the study respondents, while a few (5.4%) reported a lack of awareness of screening services and access. The study authors concluded that targeted campaigns, incentives, or opportunistic screening may prove to be more effective than the existing passive screening programs in Mongolia (12).

A study by Kaur et al. (2020) identified the barriers and facilitators for opportunistic oral cancer screening in a dental outpatient department of a secondary care hospital in Northern India. In-depth interviews were conducted with the dental practitioners and faculty in charge of a dental outpatient department. Some of the barriers reported included the lack of better linkage with referral facilities and the shortage of human resources, including support staff. The respondents stated that opportunistic screening should be integrated into the existing system; however, since public health facilities are already overburdened, there is a need for additional staff. Facilities for biopsy need to be developed. Training dentists is important to ensure quality. A well-developed system for follow-up and linkage with referral sites is required (13).

In a qualitative study conducted in Nepal on ‘Use of healthcare services by patients with non-communicable diseases’ by Khanal S et al., barriers to screening for several NCDs, including cancers, diabetes, and hypertension, were explored from the HCPs perspective. Healthcare providers reported perceiving the following barriers to screening

uptake: no government-sponsored screening programs for NCDs; and patients do not come to visit HCPs in the early phases of the disease and mostly rely on self-diagnosis and self-medication (14).

In another study by Lupafya PC et al. on ‘Implementation of Policies and Strategies for Control of Non-communicable Diseases’ in Malawi (2016), providers ’perspectives were sought to identify the barriers and facilitators related to screening uptake for the NCDs of interest. Almost all the respondents (91%) cited inadequate financial capacity, 78% reported inadequate human resources, 65% reported inadequate technical capacity, and 56% stated that the community lacked knowledge about NCDs. Lack of resources, including inadequate staff, equipment, and supplies, was the other major barrier. The study identified transportation as a major access barrier for community outreach. The study also reported on facilitators for screening uptake. Community-based clinics, enhanced NCD screening efforts, capacity-building, and better coordination and integration of services among departments were emphasized as opportunities to improve NCD screening uptake services. Effective integration of the NCD program with long-established existing health programs such as those for tuberculosis, HIV, and nutrition was suggested as an efficient way to facilitate greater community outreach and active NCD screening (15).

A systematic review on barriers and enablers to South Asian women's attendance for asymptomatic screening of breast and cervical cancers in emigrant countries by De Cuevas RMA et al. (2018) states that adequate knowledge of cancer and cancer screening services was associated with higher rates of cancer screening uptake by patients (16).

Fang CY and Ragin CC in ‘Addressing disparities in cancer screening among the U.S.’ (2020) stated that women from urban areas were more likely to have been screened if they had some form of health insurance. Integration with other existing health services (e.g., reproductive or family planning or HIV care) has a positive effect on service uptake (17).

A systematic review by Dhippayom T et al. on ‘How diabetes risk assessment tools are implemented in practice’ (2014) mentioned that the convenience of cancer screening, in

terms of accessibility (location, opening times), has a positive effect on service uptake. Women from urban areas were more likely to have been screened if they had prior knowledge about cancer (18).

A study by Copeland VC et al. on 'Effectiveness of Interventions for Breast Cancer Screening in African American Women' (2018) found that women who were well informed by their healthcare providers regarding cancer and screening methods were more likely to avail themselves of screening services. Encouragement from friends and family members to attend the screening, particularly spousal encouragement, was considered an important motivator for women (19).

A systematic review of 'Women's views on screening for type 2 diabetes after gestational diabetes' by Dennison RA et al. (2020) revealed that greater perceived susceptibility to cervical and breast cancer was associated with an increased uptake of cervical cancer screening by study subjects. Researchers reported that a positive experience with cancer screening facilitated subsequent cervical cancer screenings (20).

Teshome et al., in a study called" Perceived barriers and enablers influencing health extension workers toward home-based hypertension screening in rural northwest Ethiopia: interpretive descriptive study" in 2022, reported that barriers to effective management of hypertension include a lack of knowledge and skills among healthcare workers, which often results in the incorrect measurement of blood pressure. Furthermore, community health workers (CHWs) lack training on hypertension and a scarcity of blood pressure measuring devices and guidelines. It can be challenging to maintain the motivation of CHWs to carry out their responsibilities in hypertension screening consistently. Additionally, a lack of financial support may hinder the implementation and sustainability of this task-sharing strategy. The absence of proper supervision and support from the health system also poses a significant barrier. Enablers for effective management of hypertension include the support of community leaders, a functional development army, and the community's trust in them. Additionally, strategizing routine campaigns and having an integrated health system contribute to a positive community response (21).

A systematic review done by Fleming et al. (2015), known as "Self-Screening and Non-Physician Screening for Hypertension in Communities: A Systematic Review," revealed that research indicates that non-physicians conducting community blood pressure screenings, including self-administered tests, have effectively identified elevated blood pressure levels. Such screenings have often led to new hypertension diagnoses or initiation of treatment. Particularly, self-screening has emerged as a cost-efficient approach to pinpointing individuals with high blood pressure. They reiterated that it is vital to establish clear protocols for referrals and follow-up care for individuals identified with heightened blood pressure during screening, ensuring accurate diagnosis and effective management. The integration of modern technologies, like leveraging social media for screening promotion, utilizing smartphones, and expanding network connectivity, holds the potential to enhance the reach and efficacy of blood pressure screening in the community, especially self-screening (22).

Durao et al. in 2015 concluded their systematic review, “Evidence insufficient to confirm the value of population screening for diabetes and hypertension in low- and middle-income settings,” by emphasizing that when choosing screening interventions, it is crucial to consider the evidence of their effects on clinical and healthcare system outcomes. This notion is especially important in under-resourced health services that already face challenges in providing care for the management of chronic infectious and non-communicable diseases (23).

A study by Selvavinayagam (2018) documented Tamil Nadu's large-scale NCD screening initiative, which successfully screened over 40 million individuals for diabetes and hypertension under the state’s public health system. This initiative tackled critical challenges such as human resource management, logistical constraints, and data handling, setting a precedent for implementing similar screening programs in workplaces. The feasibility of large-scale screening suggests that systematic and employer-supported workplace screenings can be highly effective in identifying at-risk individuals at an early stage. The study emphasized that integrating such programs into corporate and industrial settings can enhance disease prevention and reduce long-term healthcare costs for both employees and employers (24).

In the broader context of workplace health, research by Sukumar and Joseph (2021) highlights the impact of NCDs on workforce productivity and economic outcomes. Their study discusses how workplace environments contribute to risk factors such as sedentary behavior, poor dietary habits, stress, and tobacco consumption. The authors argue that targeted workplace screening and intervention programs can play a critical role in mitigating these risks. They emphasize that NCD screening should not be limited to basic biometric assessments but should also incorporate mental health screenings, as psychological stress and depression are closely linked to chronic diseases. Their research suggests that workplace-based NCD screening is not just a health intervention but a crucial component of occupational health policy, aligning with India's broader public health goals and Sustainable Development Goals (SDGs) (10).

Another significant study exploring the feasibility of integrating NCD screenings into routine employee health check-ups was conducted by Sundararajan et al. (2023). This research found that employees preferred on-site screenings due to convenience and accessibility, leading to higher participation rates compared to hospital-based screenings. The study demonstrated that early detection of conditions such as hypertension and diabetes could lead to timely interventions and improved management, thereby reducing long-term healthcare costs for both employees and organizations. The research also highlighted that industries with existing health infrastructure could easily incorporate NCD screenings into their periodic health evaluations without requiring significant additional investments (25).

The growing body of literature underscores the urgent need for workplace-based NCD screening programs in Tamil Nadu. These programs offer multiple benefits, including early disease detection, reduced absenteeism, increased productivity, and cost savings for employers. Moreover, integrating these screenings into corporate wellness programs can encourage lifestyle modifications among employees, fostering a culture of preventive healthcare. The Tamil Nadu government's proactive approach serves as a model for other states and industries looking to implement similar programs. However, challenges such as ensuring follow-up care, maintaining employee privacy, and

sustaining funding for long-term screenings must be addressed to ensure the success and scalability of these initiatives.

Future research should focus on assessing the long-term impact of workplace NCD screenings on employee health outcomes, productivity, and healthcare expenditures. Additionally, comparative studies evaluating the cost-effectiveness of employer-funded versus government-funded screening programs could provide valuable insights for policymakers. By embedding workplace NCD screening within India's occupational health policies, Tamil Nadu has the potential to lead a transformative shift in preventive healthcare, ultimately improving workforce well-being and economic resilience.

1.5 Novelty of the study

The proposed study's novelty lies with the mixed methodology approach helps better to understand the enabling and disabling behaviors for Non communicable disease (NCD) screening at the workplace. By gathering extensive viewpoints from various stakeholders from Health systems (Provider) and the industrial opinion leaders and employees (receiver), the research provides a comprehensive picture of the organizational and individual screening practices. This dual view point, along with a focus on individual behavious, provides for a more in-depth analysis of reasons and impediments, resulting in practical findings for strengthening screening program. Furthermore, the study's industry specific research identifies distinct difficulties and best practices across sectors, Making the results very relevant and adaptable to a variety of organizational situations.

1.6 Ethical considerations

Ethical clearance was obtained from the Institutional Ethics committee, SRM Institute of Science and Technology (Reference Number: 0059/IEC/2024). Study was approved by DPH SAC committee(DPHPM/DPHSAC/2024/075) and permission was obtained from the Directorate of Public Health and Preventive Medicine, Tamil Nadu. Written informed consent was obtained from all participants before data collection. Confidentiality and anonymity of participant data were strictly maintained throughout the study, adhering to ethical research principles.

1.7 Expected outcomes

Through this study,

1. A comprehensive understanding of the factors that enable and disable effective NCD screening in various industries.

2.Evidence-Based Recommendations: We will Develop an evidence-based recommendations to improve NCD screening practices, addressing both organisational and individual behaviors.

3. Enhanced Health Outcomes: Contribute to better health outcomes and workplace safety through improved NCD screening practices.

4. Framework for upscaling the screening program: Establish a robust framework that can be used for upscaling workplace health screening programs in other industries.

CHAPTER 2

STUDY METHODOLOGY

2.1 Operation plan

The Study was conducted in following Phases, starting with the preparatory phase, where foundation work was carried out to establish the study's framework. This was followed by the data collection phase, during which relevant data was collected using both qualitative and quantitative methods. After this phase data analysis was done using appropriate analysis software. Finally, the findings, conclusions and recommendations were compiled into the final report

2.2 Preparatory phase

The following activities were done during the preparatory phase

- Study design including study participants
- Developing the data collection tool
- Human resources hiring
- Training the field staff

2.2.1a Study design

Mixed methodology. In-depth interview (IDI) and Key Informant interview (KII) with different stakeholders was done to get the insights on barriers and enablers of the organization. A semi structured questionnaire based quantitative study was done to assess the magnitude of each factor associated with screening.

2.2.1b Participants

Qualitative

Industry stakeholder

1. Human resource manager
2. Employee welfare officer
3. Workplace safety officer

4. Healthcare providers from the industry

5. Representative of employee union, if present

Health provider (Government)

1. Joint Director – NCD – DPH (State level)

2. District NCD program coordinator

2. District industry safety officer

3. Block medical officer

4. PHC medical officer

5. PHC staff nurse (NCD)

Sampling method

Purposive sampling technique was used in selecting the participants. This ensured the inclusion of the key personnel involved in the implementation of workplace NCD screening.

Sample size

Industries stakeholders:

150 respondents (5 stakeholders per industry; 3 industries per district from 10 districts)

From the government Health system:

25 respondents (5 providers per industry in 5 districts)

Quantitative

Study participants: Men and Women working in the organized sector

Inclusion criteria: Men and Women with age above 18 years, working in any of the selected industries, willing to participate.

Exclusion criteria: Respondents who joined the current industry in last six months with no previous experience in any other industries. Reason: To assess the effectiveness of

NCDscreening within a specific industry, employees must have worked in that industry for over six months. This criterion ensures the inclusion of individuals who may not have had the opportunity to access screening services or who have previously undergone screening in a different industry.

Sampling method

A stratified random sampling methodology was adopted in selecting the industries from strata (4 Zones). 2-3 Industries from each zone was selected randomly based on the sample frame provided by the NCD cell of DPH. 10 respondents per industry was selected completely at random using the employee list as the sampling frame.

Sample size

Considering the 20% prevalence of Diabetes among men (>140 mg/dl), 30% for hypertension (Systolic ≥140 mm of Hg and/or Diastolic ≥90 mm of Hg) or taking medicine to control blood pressure (%)) as per NFHS 5 Tamil Nadu, a sample size of 303 is needed to achieve 80% power with 5% precision.

Sample size n = 264 +39 = 303 (considering a non-response rate of 15 %)

2.2.2 Data collection tool

Qualitative study: (IDI and KII)

- Interview guide for employers (Organization head/ in-house health workers)
- Interview guide for health workers (govt health providers)

Quantitative study: (Survey)

- A semi structured questionnaire was prepared for employees
- Pilot testing was done in to validate with 5 % of the sample. Reliability of the tool was assessed using Cronbach’s alpha.
- The pilot tested semi-structured questionnaire consists of the following domains: demographic profile, Impact of Screening program and perception of individuals about the screening program.

2.2.2 a Pilot Testing

Pilot Study was done at the Industry named Steel strips wheels limited in Oragadam, Kancheepuram district. During the visit, we engaged with key personnel, including theHuman Resources, Plant head, Safety Officer, staff nurse, and medical officer from theOccupational Health Center. These meetings aimed to gather valuable insights into thebarriers and facilitators related to the implementation of NCD screening programs within theindustryand also to validate the qualitative and quantitative tools. In addition, data was collected directly from the employees regarding their experiences andperceptions of NCD screening participation.The information gathered during this visit contributed significantly to Understand the factors influencing NCD screening in the workplace and helped in refining the data collection tools.

Picture: Pilot study at Steel Strips India, Kancheepuram District

2.2.3 Manpower planning

For field data collection researchers were identified and recruited.Both for quantitative surveyandqualitative survey, experienced researchers and field investigators were selected based on interviews.

2.2.4 Training field staff

The three-day training session began with registration and self-introduction of the researchers and the trainers (core project teams), which was followed by project orientation. The researchers were oriented on the objectives, survey methodology, survey ethics, digital data collection, and do's and don'ts of the project. The investigators were clearly instructed to obtain informed consent from the respondents of the survey.

Qualitative

We trained research assistants separately for qualitative studies, focusing on gaining the respondents' trust and conducting the interviews by sharing the pros and cons. The interview checklist was shared with each researcher, and each point was explained in detail. Mock interviews were conducted to clarify their doubts and for better understanding of the concepts.

Quantitative

We discussed every question in the questionnaire in both Tamil and English during the second session. We developed the questionnaire in English, translated it into Tamil for easy understanding, and then returned to English to ensure translation accuracy. Following the full discussion on the questionnaire, the field investigators were asked to conduct mock interviews on day 2, through which the project team assessed the interviewing skill of the researchers.

The third day was dedicated to Open Data Kit (ODK) training. ODK is an open-source Android app that replaces paper forms used in survey-based data gathering. The finalized submission can be sent to (and new forms downloaded from) a server. We explained to all the researchers how to use ODK for digital data collection and its

functions to ensure effective and efficient data collection. After training, practical exposure was also demonstrated, whereby trainees conducted mock interviews using ODK, which helped the investigators clarify their doubts. These repeated training sessions helped the researchers to have a deeper understanding of the survey questionnaire.

2.3 Data collection

Qualitative

The In-depth interviews was conducted at all levels of Health system to understand the barriers and enablers at broader view. Starting from WHV from Field level including all mentioned in the participants list to the JoIntDirector of NCD division at Directorate of Public Health & Preventive Medicine in state level.

Picture: At the Joint Director Office, DPH& PM after the IDI

The interviews were recorded with the respondent's consent. The recorded audio data was transcribed and analysis began with reading the transcripts again and again to achieve immersion into the data. Then abstract ideas were extracted as open codes and then similar codes were discussed by the research team and sorted into categories. Based on the categories, themes were generated that represent significant issues with enablers, disablers and execution of the NCD screening Implementation. The transcript was coded by two researchers separately to ensure quality and reduce inter-coder variability.

Picture: Field photos of IDI with the NCD Coordinators at District level

Picture : Field Photos of IDI with Industry key stakeholders

Quantitative

The quantitative data collected was cleaned and analysed using SPSS software to find out the trends of utilization of health services. Participants' responses and the health records was reviewed and cross-verified for the analysis.

Picture : Data Collection from Employees

Picture: IDI with Government Health Care Providers

2.4 Data Analysis

Qualitative Data:

Data was coded using Atlas.ti Version 25 software and analyzed using CFIR framework (Consolidated Framework for Implementation Research). First initial codes were formed and grouped under sub themes based on the results. The sub themes were then brought under the major themes of CFIR framework to assess implementation Disablers and enablers.

Quantitative Data:

Data were analyzed using Statistical Package for Social Sciences (SPSS) Version 29. Descriptive statistics, such as means and standard deviations, were used to summarize continuous variables, while frequencies and percentages were used for categorical variables. Binary logistic regression was used in determining the factors influencing employee's participation in the workplace NCD screening programs.

2.5 Report preparation

Qualitative

Themes were developed using an inductive approach where the collected interview data was used to determine the themes and results were interpreted in the form of narrative analysis in the report.

Quantitative

Tables were generated based on the indicators needed from the data using SPSS software and the results were interpreted in the report.

CHAPTER 3

QUALITATIVE SURVEY RESULTS

3.0 IPO Model

The study utilized the Input process and Output (IPO) model and the Consolidated framework for implementation research (CFIR) to analyze and interpret the implementation of Workplace Non-Communicable Disease (NCD) screening programs. The IPO model offers a structured approach to examine the short-term outcomes of the pilot program but focusing on three components:

Input: which includes health system, industry, and individual factors;

Process: which involves strategies for planning, engaging employees, executing, and evaluating the screening;

Output, which examines employee perceptions, beliefs, knowledge, attitudes, and motivation to participate.

In addition, CFIR model was applied to identify and understand the disablers and enablers influencing the implementation process. By integrating these two frameworks, the study not only evaluated the immediate outcomes of the pilot but also gained deeper insights into the factors that impacted the programs uptake and effectiveness, providing a comprehensive understanding of both the short-term results and the underlying implementation dynamics.

3.0.1 Consolidated Framework for Implementation Research

The Consolidated Framework for Implementation Research (CFIR) is a comprehensive framework used in implementation science to study factors affecting the adoption, execution, and sustainability of interventions. It provides a structured approach by categorizing key influences across five domains: Intervention Characteristics, Outer setting, Inner setting, Characteristics of Individuals and Process of Implementation. For this study following four domains were used to assess implementation challenges and

inform strategies for improving intervention uptake of workplace Non-Communicable Disease (NCD) screening program.

1. **Outer Setting Domain** – External influences like government policies, insurance coverage, and stakeholder demands, especially health systems
2. **Inner SettingDomain**– Organizational culture, leadership engagement, and available resources within companies.
3. **Individuals Domain** – Employee perceptions, beliefs, knowledge, attitudes, and motivation to participate in screening.
4. **ImplementationProcess Domain**– Strategies used for planning, engaging employees, executing, and evaluating the screening.

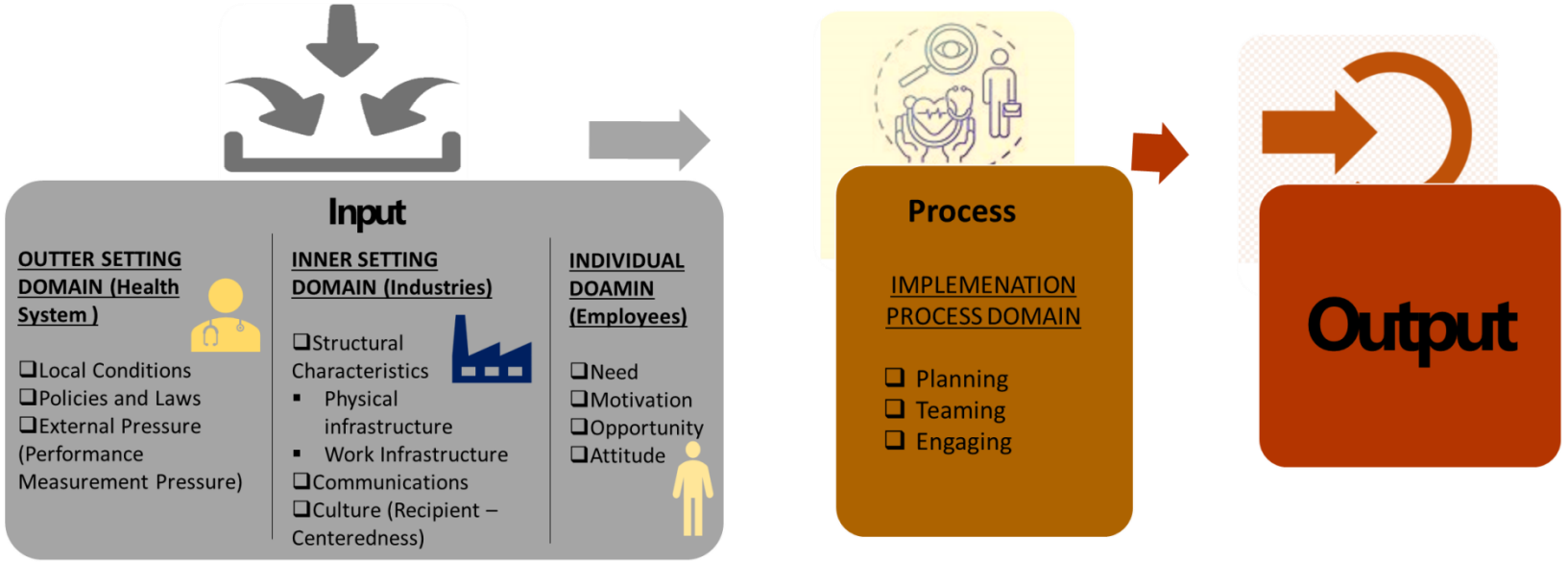
These domains guide the coding of interview transcripts, ensuring a structured approach to data classification. Once data is coded, CFIR is used to analyze emerging themes, patterns, and relationships among different constructs. This involves identifying common themes across multiple workplaces to determine key facilitators and barriers, exploring interactions between CFIR domains, such as how organizational support (Inner Setting) influences employee participation (Characteristics of Individuals), and differentiating workplace contexts to understand variations in program implementation across industries (26).

By using CFIR for thematic analysis, findings were compared across different organizational settings and assess disabling and enabling factors that contribute to successful NCD screening implementation. The factors are tabulated in Annexure I and for key findings of district wise Disablers and Enablers refer Annexure II.

3.1 Disabling factors of Workplace Screening analyzed using CFIR

Disabling factors are conditions, obstacles, or barriers that hinder or prevent the success of an initiative, activity, or process. These factors create challenges, limitations, or resistance that make achieving goals more difficult.

Disablers of Workplace NCD Screening



3.1.I OUTER SETTINGDOMAIN (Health System)

3.1.I.1 Local Conditions

i. Fractured continuity of screening

Ensuring continuity and regular follow-up in workplace NCD screening is crucial for effective health monitoring and long-term impact. Rather than conducting screenings as a one-time activity, it is essential to establish a systematic and ongoing process. Regular follow-ups allow for better tracking of health conditions, timely interventions, and improved health outcomes for workers.

Extending the screening process and maintaining continuity would not only enhance efficiency but also ensure that necessary medical support and preventive measures are consistently provided. A structured approach to follow-ups would help identify and address health concerns at an early stage, reducing the burden on both the healthcare system and the affected individuals.

An Employer said,

“Extending and following up would be beneficial. It would make continuity easier. Rather than doing it just once, continuing it regularly would be better.”

ii. Facilitation by DISH for organizing advocacy meetings with key officials

The lack of communication from the Directorate of Industrial Safety and Health (DISH) has further complicated the screening process. Industries are often unaware of their obligations and the necessary steps for conducting workplace screenings, leading to delays and resistance in implementation. The absence of clear directives from DISHresults in confusion and lack of coordination between industries and healthcare teams.

iii. Lack of Human resources (Available team, including lab technician)

Limited healthcare personnel make it difficult to organize and execute screenings effectively. A lack of trained professionals also impacts post-screening follow-up services, reducing the overall impact of these initiatives.

A Health Care Provider said,

"Right now, when screening camps are conducted, only the available staff have to manage everything. Manpower is a challenge."

Using Available team

No separate teams are assigned for workplace screenings, which places an additional burden on the already engaged Mobile Medical Unit (MMU) teams. This added responsibility strains existing healthcare workers, leading to reduced efficiency and burnout.

A Health Care Provider said,

"The Labour MMU and other MMU teams are involved. Yes, it is additional work—no new teams are assigned. The existing team is solely responsible for workplace NCD screening, and they already have a heavy workload."

No separate lab technician

The absence of a dedicated lab technician for workplace screenings affects the efficiency of conducting blood tests and other diagnostic evaluations. This leads to delays in test results, which in turn impacts timely treatment decisions.

A Health Care Provider said,

"So far, no lab technician has been assigned for blood tests during the screenings."

iv. Inadequate amount of consumables

Glucostrips

One of the key challenges in the workplace NCD screening process is the insufficient supply of glucostrips, which are essential for blood glucose testing. Given the large screening population, the demand for glucostrips is significantly high, requiring a continuous and adequate supply to ensure effective testing.

The limited availability of glucostrips often results in delays or incomplete screenings, as the available stock is insufficient to cover all eligible individuals. This can lead to missed opportunities for early detection and intervention of diabetes among workers.

Batteries or rechargeable batteries

To ensure efficient and uninterrupted usage, the BP monitor and glucometer should be equipped with rechargeable batteries and an AC adapter, as single-use batteries deplete quickly and may hinder patient care. It is critical to verify the battery capacity, ensuring it supports at least 50-100 readings per charge to meet the demands of a Primary Health Center (PHC)setting. Additionally, confirming the inclusion of an AC adapter is essential, as rechargeable batteries alone would be insufficient without a proper charging mechanism.

A Health Care Provider said

"*The BP monitor and glucometer should have rechargeable batteries and an AC adapter for easy use. One-time-use batteries run out quickly, especially when checking many patients, so they are not practical. We also need to check the battery capacity to make sure it lasts for at least 50-100 readings per charge. An AC adapter is important for quick recharging. Without these, the project may face problems, making patient care less efficient."*

Limited Availability of Screening Equipment

In many cases, workplace screenings depend on Primary Health Centers (PHCs) for equipment. However, the lack of sufficient medical devices at PHCs makes it difficult to conduct smooth and effective screenings in industries, affecting the reliability of diagnostic tests.

A Health Care Provider said,

"When we take screening to industries, the PHC often lacks the necessary equipment. So, we need to arrange for additional equipment before conducting screenings in industries."

v. Lack of Vehicle for the screening team

The absence of a dedicated vehicle has posed significant challenges in ensuring efficient staff mobility. Whenever industry visits are required, a vehicle is essential for seamless operations. In cases where no official vehicle is available, private transportation must be arranged, which is neither cost-effective nor sustainable.

Requests for vehicles frequently encounter unavailability. If the MTM vehicle is inaccessible, reliance must be placed on the PHC vehicle or those assigned to other teams. However, given that these teams are engaged in routine field visits, securing transportation becomes increasingly difficult. The lack of a designated vehicle has led to operational delays and logistical constraints, impacting the overall efficiency of fieldwork.

A Health Care Provider said

“There is no vehicle for us. Whenever our staff needs to go to the industry, we need a vehicle. If not, we have to arrange a private auto to go.”

AnotherHealth Care Provider replied

“If we ask, there is no vehicle. If the MTM vehicle is unavailable, we have to use the PHC vehicle or those of other teams. However, since the concerned team is also traveling for their routine field visits, arranging a vehicle becomes a bit difficult.”

3.1.I.2Policies & Laws

i. Unawareness of guidelines or protocols

A significant challenge in workplace NCD screening is the lack of awareness regarding established guidelines and protocols among industry personnel and healthcare workers. The absence of clear instructions leads to inconsistencies in screening procedures, reducing the effectiveness and accuracy of the process. Many healthcare workers are not adequately trained on workplace screening protocols, and industries may not fully understand their role in facilitating screenings.

ii. Post screening follow-up of workers health and treatment especially for short term / contractual workers is limited

Even when employees undergo initial screening, ensuring they follow up for further evaluation or treatment remains a challenge. Many workers fail to seek medical advice post-screening, leading to untreated conditions that may worsen over time. Factors such as work pressure, financial constraints, and lack of awareness contribute to this reluctance.

A Health Care Provider said:

"When we conduct screening, if we inform them that they have a disease, they are initially concerned. Later, we refer them to the PHC for further treatment, but no one goes to the PHC or takes treatment. We are unable to follow up with them. In some companies, this issue is even more prevalent."

Post-screening follow-up of migrant workers

Migrant workers frequently relocate due to job changes, making it difficult to track them for follow-up care. Many do not have a stable residence or long-term healthcare provider,

resulting in discontinuation of treatment. The transient nature of this workforce poses a major obstacle in ensuring continuous healthcare engagement.

A Health Care Provider said,

“There are Many migrant populations, for them follow up is a problem.”

iii. Referrals provided for individuals based on the current residence

Employees who belong to different districts may face difficulties accessing healthcare services outside their home areas. Some may lack awareness of healthcare facilities in the district where they work, while others may find it in;aconvenient to travel for follow-up treatments. This results in delays in seeking necessary medical interventions.

A Block Medical Office said,

"Referral is given for workers from different districts, which makes follow-up and treatment challenging."

3.1.I.2External Pressure (Performance Measurement Pressure)

Additional responsibility and monitored for achieving the targets

The integration of workplace NCD screening has increased the existing workload, as no additional teams have been assigned for this task. The current workforce, including MTM (MakkalaiThediMaruthuvam) team, HIs (Health Workers), and WHVs (Women Health Volunteers) working in industries, is responsible for managing both workplace and population-based screenings simultaneously. These staff members already have established targets for household screenings, tablet distribution, and mobilizing cases to Primary Health Centers (PHCs). The added responsibility of workplace screening has an impact on their routine fieldwork. Given these constraints, officials prioritize workplace screenings to enable staff to resume their regular community-based health activities at the earliest.

A Health Care Provider said,

"Yes, it is additional work—no new teams are involved. The existing team is responsible for workplace NCD screening, and they already have a heavy workload. We need additional manpower. Currently, MTM and HIs, as well as WHVs in industries, must also conduct population-based screening in addition to workplace screening. They have fixed targets for screening households, cancer screenings, and mobilizing cases to PHCs. As a result, their routine tasks are getting affected. We try to complete workplace screening first so they can return to their fieldwork."

3.1.II INNER SETTINGDOMAIN (Industries)

3.1.II.1 Structural Characteristics (Physical Infrastructure)

Unavailability of adequate space for screening

One of the major barriers to effective Non-Communicable Disease (NCD) screening in workplaces is the lack of proper infrastructure. The absence of a designated screening area creates inconvenience for employees**,** leading to reduced participation. Without a structured space**,** screenings may be conducted in crowded or uncomfortable settings**,** discouraging employees from taking part.

Providing an adequate screening areawithseating arrangements, privacy for medical consultations, and a comfortable environmentcansignificantlyimprove participation rates**.** A well-organized setup not only ensures a smoother screening process but also enhances the overall credibility and effectiveness of workplace health programs.

A Health Care Provider said,

"We do not have a proper space here, so patients have to wait in an uncomfortable setting."

3.1.II.2Structural Characteristics (Work Infrastructure)

i. Lack of resources for replace, so that it will not affect theproduction

Contract/temporary employees

Screening regular employees is easier since they attend work consistently. However, contract employees pose a challenge due to their irregular work schedules**.** Their availability depends on workforce assignments, making it difficult to plan screenings effectively. Even when present, contract workers often have strict time constraints**,** limiting their ability to leave work for screenings. Unlike regular employees, they may not be allowed extended breaks, impacting participation in health check-ups.

Additionally**,** coordination with HR, General Managers (GM), and other supervisors is necessary, as contract employees are engaged in production tasks. Getting approval for their participation can be difficult, as work efficiency is often prioritized. Reaching these employees during working hours is also challenging, further complicating the process.

A Health team reported,

*“One of the main challenges in screening is the availability of contract employees**.** Unlike regular employees who come to work daily, contract workers' presence depends on the assigned workforce at that time. Even if they are present, they are often not allowed to leave work for long.Another issue is coordination with HR, GM, and other managers**.**Since these workers are busy with their tasks, reaching them during working hours is difficult. This makes it challenging to ensure that all contract employees participate in the screening process”.*

Migrant workers

In recent days, the decline in local employment has led to an increased reliance on migrant workers from other states. A significant observation is that the majority of these workers fall within the 20-25 age group. Since this age group is generally perceived to be

at lower risk for non-communicable diseases (NCDs), there is oftenlow participation in screening unless it is made mandatory.

Another challenge is the high mobility of migrant workers. Unlike local employees, they do not remain in one workplace for long periods but frequently move and change jobs. This constant movement makes it difficult to conduct consistent health screenings and follow-ups, potentially leading to missed opportunities for early detection and intervention.

A Health Care Provider said,

"There are Many migrant populations, for them follow up is a problem. Another challenge is that these workers do not stay in one place for long; they keep moving and changing their workplacefrequently make consistent health monitoring and follow-ups challenging"

An Employer said,

"With the decline in local employment, we have been relying more on migrant workers, mostly aged 20-25.Since people in this age group are generally perceived to be at lower risk for diseases, they do not readily come forward for screening unless it is made mandatory"

ii. Production time/working hours

Despite obtaining permission and setting up screening camps, worker attendance remains uncertain due to industries prioritizing production efficiency over health initiatives. Many industries do not consider screenings a priority, leading to limited cooperation in mobilizing workers.

A major challenge is the strict production targets that workers must meet daily. Since their workload is tied to output expectations, they hesitate to participate in screenings if it disrupts their tasks. This reluctance is not due to lack of interest, but rather the pressure to maintain productivity.Additionally,supervisors may be unwillingto release workers for screenings, further limiting participation.

A Health Care Provider said,

"Even if we get permission and set up screening camps, attendance is uncertain. Industries prioritize production, and cooperation from their side is lacking. They do not consider it important."

A Health Care Provider said,

"Industries operate with production targets. Workers must complete a certain number of bundles in a day, so they hesitate to participate in screening if it affects their targets. Their intention is not to avoid cooperation, but they cannot afford disruptions in production. Balancing both aspects has been challenging."

3.1.II.3 Communications

i. Unawareness about the screening

A major challenge in conducting health screenings was worker resistance**,**mainly due to fears ofjob loss or discriminationbased on their results. Many employees were hesitant, highlighting the need for targeted awareness efforts to build trust and encourage participation. Lack of awareness played a key role in this hesitation, as some workers did not fully understand the importance of early detection and disease prevention**.** Additionally, stigma surrounding certain health conditions discouraged participation. While some workers were open to screening**,** others refused**,** and some even felt uncomfortable with home visits, citing privacy concerns or fear of social judgment.

A Health Care Provider said,

"Workers were initially resistant, fearing that screening results would lead to permanent consequences. We had to convince them before proceeding with the screening. Many people lack awareness, and there is still stigma among them. Some are willing to undergo screening, while others refuse, and some even find home visits uncomfortable."

ii. **Helping the public, understand their health issues and ensuring they receive treatment**

A major challenge in conducting health screenings was worker resistance**,** mainly due to fears of job loss or discrimination based on their results. Many employees were hesitant, highlighting the need for targeted awareness efforts to build trust and encourage participation.Lack of awareness played a key role in this hesitation, as some workers did not fully understand the importance of early detection and disease prevention**.**Additionally, stigma surrounding certain health conditions discouraged participation. While some workers were open to screening**,** others refused**,** and some even felt uncomfortable with home visits**,** citing privacy concerns or fear of social judgment.Educating workers on the benefits of screening, ensuring confidentiality, and clarifying that results will not impact their employment can help build confidence and acceptance**,** ultimately improving participation and workplace health.

A Health Care Provider said,

"Challenges exist at every level. When we tell them their blood test results indicate high sugar levels, they do not accept it. If we say they have high blood pressure, they become anxious but still refuse to acknowledge it. Even when ECG results show heart abnormalities, they refuse to believe it. Identifying their condition is one thing, but making them take medicines and follow up for treatment is an even bigger challenge."

3.1.II.4 Culture (Recipient-Centeredness)

Lack of a positive attitude towards the overall treatment process

Some employees view workplace screenings as unnecessary**,** rather than recognizing them as a proactive health measure. This perception leads to hesitation and resistance**,** making participation a challenge. Many believe that medical tests are only needed when symptoms arise**,** while some fear that results could impact their job security or require lifestyle changes they are unwilling to make. Others worry about being advised to take

medications or change their lifestyle**,** which they may see as an inconvenience. This fear and reluctance further contribute to their avoidance of screenings**.**

A Health Care Provider said,

"Many workers do not understand the purpose of screening. They do not see it as something done for their well-being but rather as an unnecessary process."

3.1.IIIINDIVIDUAL DOMAIN (Employees)

3.1.III.1 Need

i. Limited awareness about screening

One of the significant challenges in promoting health screenings is the lack of public awareness. Despite efforts to educate individuals, many still do not recognize the importance of routine health check-ups, especially after the age of 30. To bridge this gap, awareness initiatives are integrated into various platforms, including community meetings and educational settings.

Efforts extend beyond workplaces and individuals, with sensitization programs being conducted at schools, even during morning assemblies. This proactive approach aims to instill a culture of preventive healthcare from an early stage. However, there remains a need for continuous engagement and awareness-building, as many people still do not prioritize screenings unless symptoms appear. Strengthening awareness campaigns and emphasizing the necessity of early detection can improve participation rates in health screenings.

A Health Care Provider said,

"Public awareness about health screenings is somewhat low, but we try our best to address it. In every meeting we attend, we discuss the importance of screenings whenever we get the opportunity. Beyond targeting individuals, we even conduct sensitization programs at the school level, including during school prayers."

A MO replied

"People still do not fully understand the importance of screening after the age of 30. Routine health check-ups should be considered essential, but there is still a lack of awareness."

ii. **Stigma**

A significant challenge in conducting health screenings is the lack of awareness and the prevailing social stigma, especially in rural areas. While many individuals are willing to participate, some refuse due to misconceptions or fear of being judged. The reluctance is particularly evident inhome screenings, where some individuals feel uncomfortable undergoing tests in their personal space.

Additionally, societal stigma plays a role in discouraging participation. In certain cases, individuals do not want their neighbors to know they have conditions like diabetes or high blood pressure, fearing judgment or discrimination. This hesitancy prevents them from seeking timely medical intervention, further reinforcing the need for awareness campaigns and sensitization efforts to normalize regular health check-ups.

A Health Care Provider replied

"Some people still lack awareness, and there is also a lot of stigma among them. While many are willing to undergo screening, some refuse to participate. Additionally, some individuals feel uncomfortable with home screenings."

Another response was

"There is still social stigma in rural areas. I have seen cases where people don't want their neighbors to know that they have diabetes or high blood pressure. They feel it should remain hidden."

iii. Self Interest of the participants

The willingness to participate in health screenings largely depends on an individual's self-interest and awareness of its benefits. Those who recognize the importance of early detection and preventive care are more likely to take part, while others may disregard screenings unless they experience noticeable symptoms. Many employees, especially younger ones, do not prioritize routine check-ups, assuming they are healthy. Another factor affecting self-interest is workplace culture. Employees who feel encouraged bymanagement and colleagues to take health initiatives seriously are more likely to engage in screenings.

3.1.III.2Motivation

Lack of Motivation

Motivating employees to participate in health screenings remains a challenge, particularly among older age groups. Employees aged 40-50, especially those with some level of education, tend to be more receptive to blood tests and other screening procedures. However, those aged 60 and above often show reluctance, regardless of the efforts made to convince them.

This hesitation may stem from a lack of awareness, fear of medical diagnoses, or a general unwillingness to change their health routines.

A Health Care Provider said,

"Employees in the 40-50 age group, especially those with some level of education, are more open to blood tests. However, those aged 60 and above are reluctant, no matter how much we try to convince them."

3.1.III.3Opportunity

Well-structured health facilities available within the industry

In some industries, the presence of an in-house Occupational Health Centre (OHC) reduces the reliance on external healthcare services. These facilities function like private healthcare units, managing most medical needs internally. As a result, external health initiatives primarily focus on raising awareness and providing additional support when necessary. However, direct intervention is often limited, as employees prefer to consult their in-house medical teams.

Additionally, timing constraints pose another challenge. Employees working in shifts may find it difficult to visit Primary Health Centers (PHC)orEmployee State Insurance (ESI)facilities within their operational hours. Many workers perceive on-site healthcare services as more convenient, considering them as doorstep healthcare**.** While this setup ensures easy access to medical care, it also reduces participation in external health screenings, requiring more targeted efforts to encourage preventive check-ups.

A Health Care Provider said

"In some industries, there is an in-house Occupational Health Centre (OHC), where they manage health-related activities on their own, similar to a private firm. Our role is mainly to provide awareness, and if someone requires additional support, we facilitate it. However, in most cases, they rely on their OHC for medical care."

An Employersaid

"Since medical facilities are available within the industry, employees rely on them, reducing the need to seek external care. Another challenge is timing—employees finish their shifts and may not be able to visit PHC or ESI. Since they stay here, they feel that having a doctor come to them is more convenient, and they perceive this as doorstep healthcare."

3.1.III.4 Attitude

Challenges arise as workers from other states do not visit the ESI due to issues with direction, approach, and the presence of an OHC

One of the major challenges in workplace health screening is ensuring that migrant workers from other states utilize their entitled healthcare services, such as the Employees'State Insurance (ESI) scheme**.** Many workers lack awareness about the location, procedures, and benefits of ESI facilities**,** making it difficult for them to seek medical assistance outside their workplace. Language barriers and unfamiliarity with local healthcare systems further discourage them from visiting ESI hospitals or dispensaries.

Additionally, the presence of in-house Occupational Health Centres (OHCs) within industries often reduces the motivation for employees to seek external healthcare services. Since medical professionals visit the workplace for screenings and minor treatments, workers find it more convenient to access care on-site rather than navigating external healthcare facilities. While this setup ensures immediate medical attention, it may also limit the workers' engagement with more comprehensive health services available through ESI.

An Employer said,

"Maybe they don't know how to go to ESI and about it, as there isn't enough awareness. That is a major issue. Additionally, when workers come from other states, it adds another layer of difficulty in approaching them."

Another Employer said,

"Yes, they are being taken care of, but they are just staying here and not utilizing external services. Since doctors are coming here, they feel it's convenient, so they don't see the need to go outside for screening."

3.1.IVIMPLEMENTATION PROCESS DOMAIN

3.1.IV.1 Planning

i. Mobilization of workers

Management and administration play a crucial role in ensuring worker participation in NCD screenings**.** However, production demands often take precedence, leading toreluctance in mobilizing employees for health check-ups. Supervisors and managers may be hesitant to release workers for screenings, fearing disruptions to productivity. This results in low participation rates, as employees are either unavailable or discouraged from attending.Strongcoordination between management, health teams, and employees can help strike a balance between work efficiency and employee well-being**.**

A Health Care Provider Said,

"Management takes a slow approach in facilitating worker participation."

ii. Unmatched shift time for providers and employees

Covering employees from all three shifts poses a significant logistical challenge**.** Since workers operate on rotating shifts**,** conducting screenings within a single day makes it difficult to reach everyone effectively**.**

Additionally, some employees request screenings for their family members, further increasing the scope and complexityof the process. Extending the screening over three to four dayswould allow for better coverage and participation**,** ensuring that workers from all shifts have the opportunity to be screened without disrupting their work schedules**.**Thechanging shift patterns make it harder to track participation and follow up on those who miss the screening.

An Employer said,

"We need to cover employees from all three shifts, which is quite difficult. Some workers also want their family members to be included, adding to the challenge. If we extend the

screening over three to four days, we can manage better. However, conducting it in a single day makes it hard to reach everyone. The changing shift patterns make it difficult to ensure all workers are screened properly."

Extended screening time due to

One of the major barriers to workplace NCD screening was ensuring participation from employees working in rotating and night shifts. While some industries attempted to address this challenge by conducting screenings outside of regular work hours, employee availability and willingness remained a concern.

A Health Care Provider said,

"To cover all shift workers, screenings are conducted after work hours. However, ensuring their availability and willingness to stay back for screening is a challenge."

iii. Proper planning to accommodate night shift employees and early shifts

In industries operating on a three-shift system, conducting health screenings poses logistical challengesdue to varying work schedules. Unlike regular daytime employees, night shift workers complete their shift in the early morning and typically leave immediately to rest**.**Screening them right after their shift is not practical**,** as fatigue may deter participation, and requiring them to stay back could cause inconvenience and resistance**.**

To ensure inclusive screening coverage, the process must be extended over multipledays**,**usually2-3 days**,** to accommodate workers fromall shifts**.** This allows screenings to be conducted at appropriate times without interfering with their work schedules or rest periods**.**

A Health Care Provider said,

"In some industries, employees work in three shifts. Screening night shift workers the following morning is not feasible. As a result, the screening process was stretched over 2-3 days to accommodate them."

A OHC Health Care Provider said,

"Screening camps are typically scheduled during the day, from 8 AM to 5 PM. However, factories, such as sugarcane processing units, usually operate 24 hours a day. Currently, due to reduced production, the factory runs only in one shift from 8 AM to 5 PM, allowing us to cover most employees. But in full operation, only half of the workforce is present at a time, while the rest are off duty. These employees return after 1-2 months, making it difficult to ensure their participation in screening sessions. Since screenings are conducted only during morning or afternoon hours, night shift employees often get excluded."

Early shifts

Ensuring continuous and well-coordinated workplace NCD screenings presents significant operational challenges. Given that workers begin their shifts as early as 7–8 AM, screenings must be conducted before their official punching time to ensure participation.

Once employees commence their work, conducting screenings within the factory becomes highly impractical due to operational constraints. To address this, multiple screeningsessions were scheduled between 7–8 AM. However, after 10 AM, screenings were no longer feasible, limiting flexibility and accessibility. This restricted time window posed a logistical challenge, necessitating precise coordination to maximize participation while minimizing disruptions to production.

A Health Care Provider said,

"Screening has to be conducted continuously and well-coordinated. It is not easy because workers arrive for their shifts by 7 or 8 AM, and we must screen them before their

punching time. Conducting screenings inside the factory after this time is difficult, as they remain engaged in work. Coordination was a major challenge, requiring multiple screening sessions between 7-8 AM. After 10 AM, screening was not feasible, making early morning screenings a significant drawback."

iv. Limited time allocated for screening activities

The restricted time allocated for workplace health screenings presents a significant challenge in ensuring full employee participation. With structured shift schedules, especially in industries operating in three shifts, many employees—particularly night shift workers—find it difficult to participate within the short screening window. Conducting screenings in a single day limits accessibility and may result in missed opportunities for early detection of health conditions.

Screening sessions are typically scheduled before employees begin their shifts to minimize disruptions to production. However, this narrow timeframe often creates a rushed process, affecting the quality of screenings and discouraging participation. Furthermore, industries prioritize production targets, making it difficult to allocate extended time for health assessments. Employees may hesitate to participate if they fear it will interfere with their work commitments.

A Health Care Provider replied,

"Conducting screenings within a limited time frame is challenging, especially when employees have strict work schedules. Night shift workers, in particular, find it difficult to participate. Extending the screening over multiple days would allow better coverage and ensure that more employees can be screened without disrupting their work."

A HR replied,

"With production being a priority, the time available for screening is often restricted. If we receive the schedule in advance, we can coordinate better. A single-day screening may not be sufficient, but spreading it over multiple days would help cover more employees while minimizing workplace disruptions."

v. Time required for planning and organizing screening/ health camps

Proper planning and organization are essential for the successful implementation of workplace health screenings. HR teams emphasize the need for advance notice to ensure smooth execution without disrupting daily operations. Ideally, a one-month notice allows for systematic scheduling, allocation of time slots, and coordination of logistical arrangements. However, even with 15 days' notice, necessary preparations can be managed effectively.

Since employees work in shifts, screening schedules must be aligned with their availability. If informed at least ten days in advance, HR teams can ensure that the required workforce is accommodated without affecting production. Additionally, industries need time to make provisions for space, seating arrangements, and ensuring that employees are available at the designated time slots. Without sufficient time for planning, participation rates may decline, and operational disruptions may occur.

An Employerreplied,

"If you inform us ten days in advance and specify how much time is needed for the screenings, we can plan accordingly. Since employees come on a shift basis, if you also provide the expected number of participants, we will make the necessary arrangements to accommodate them."

Another Employer replied,

"Ideally, one month in advance would be best. If we are informed a month ahead about the screenings / camps, we can plan everything properly. Even with 15 days' notice, we can still manage to meet the requirements. So, with proper planning, we can ensure that production is not affected."

vi. Communication gaps among colleagues

Effective workplace health screenings require seamless coordination among various teams, but communication gaps among colleagues often create challenges. In many

instances, key information regarding screening schedules, locations, or expectations is not effectively conveyed across all levels of the workforce. This can lead to confusion, missed opportunities, and last-minute rushes, reducing overall participation and efficiency. Additionally, when different departments or shifts are not properly informed, employees may assume the screening is not relevant to them or may not allocate time to participate.

vii. **Unawareness about the program, team involved, or purpose of the initiative**

A significant barrier to successful health screenings is the lack of awareness among employees regarding the program itself. Many workers do not understand why these screenings are being conducted, which team is responsible for organizing them, or how the results can benefit them. This lack of clarity often results in low participation, hesitation, and resistance to screening procedures**.** Employees may also perceive screenings as unnecessary disruptions rather than preventive health measures.

3.1.IV.2 Teaming

i. **Delayed permission**

One of the major challenges in implementing workplace screenings is the delay in obtaining permission from industry management. Even when approval is eventually granted, the process takes considerable time, leading to scheduling difficulties and disruptions in planning.Industries often follow a hierarchical decision-making process, where approvals must go through multiple levels of authority. Initial screening requests are rarely acknowledged immediately. Instead, they require persistent follow-ups and multiple discussions before receiving confirmation. This lack of prompt response prolongs the process, making it difficult to conduct screenings efficiently.Since, screenings must be scheduled around their workflow, any uncertainty in permission approval creates additional barriers.

A Health Care Provider said,

"One major barrier is the delay in granting permission. Even when they eventually approve, it takes a long time to get their confirmation."

A Health Care Provider replied,

"Getting permission in industries is extremely difficult. When we initially ask, there is no immediate response. Only after multiple discussions and follow-ups do we finally receive approval."

ii. **Approaching large-scale industries**

In certain industries, one of the key barriers is the multi-level approval process required before conducting screenings. Any request for screening must first be presented to the Assistant General Manager (AGM)**,** who then escalates it to the General Manager (GM) for final approval. Only after obtaining clearance from senior management is a date allocated for screening activities. This structured hierarchy makes immediate or spontaneous screenings infeasible**,** often resulting in delays.Additionally, industries prioritize production targets and operational efficiency, making it difficult to accommodate health screenings during working hours. The screening process must align with their internal schedules, requiring careful coordination to avoid disruption to productivity. Industries with proactive management and streamlined approval processes exhibited higher participation rates in screening programs.

A Health Care Provider said,

"In some industries, direct engagement is not possible. The process involves multiple levels of approvals – first, we need to meet the AGM, who then refers us to the GM. Only after obtaining official permission from higher authorities do they provide a scheduled date for screening. This makes immediate or spontaneous screening impossible."

iii. **Headquarters located in another country**

One of the primary hurdles in conducting workplace screenings in private industries is the delay and complexity of the approval process**.** Unlike government-run factories, which are generally more cooperative, multinational corporations (MNCs) pose significant challenges due to their multi-tiered approval structures.

For instance, in certain factories, local management does not have the authority to approve health screenings. Instead, they are required to seek approval from their headquarters**,** which may be located in another country. This leads to delays and, in some cases, a complete lack of response**,** making it difficult to proceed with the screening.

Even when industries express initial interest, the lengthy decision-making processand the need for approvals from higher management often result in indefinite delays. This bureaucratic process becomes the biggest obstacle, rather than the screening itself.

A Health Care Provider said,

"This is the main hurdle which I faced in these private institutions. Government factories are more cooperative, but in MNC factories, it's a challenge. For example, there is a factory near Perungalathur—when we approached them for screening, they didn't provide an immediate response. They mentioned that their headquarters is in Dubai and that they need to seek approval from there. After that, there was no further discussion. This is the real hurdle I am facing; otherwise, screening itself is not a problem—getting approval is the main issue."

iv. Travelling to industrial sites

Reaching rural areas for NCD screenings involves transportation difficulties, time constraints, and logistical challenges. Long travel distances and poor road conditions can cause delays, making it harder to conduct screenings efficiently.Staff availability is another concern, as health workers must allocate extra time for travel, impacting their other duties. Additionally, low health awareness in rural communities makes mobilization and participation more difficult, requiring additional efforts to encourage screening.

Despite these challenges, government support helps manage logistics, but effective planning and coordination are essential to ensure smooth execution in rural areas.

A Medical Officer said,

"Reaching rural areas is difficult due to long distances and poor roads. People also need more awareness, so mobilizing them takes time. But with good planning, we make it work."

3.1.IV.3 Engaging

i. Convincing the management

Securing permission for workplace screenings in industries is a significant challenge. Management often does not provide an immediate response, leading to delays in the approval process. Even when companies acknowledge the importance of screenings, production prioritiestake precedence, causing reluctance to allocate time for employee health checks. Approval is usually granted only after multiple discussions and continuous follow-ups with different levels of management. This prolonged convincing process makes planning and execution difficult, often delaying the screenings beyond the intended timeline.

A Health Care Provider said,

"Getting permission in industries is very difficult. When we initially request approval, there is often no immediate response. Only after repeated discussions and continuous follow-ups are we able to secure permission."

ii. Limited industry Co-operation

Even after securing approval and setting up health screening camps, employee participation remains a challengedue to a lack of industry cooperation**.** Industries prioritize production targets over employee health, often failing to facilitate worker participation.

Despite requests for support, management does not actively encourage employees to attend screenings**,** leaving healthcare teams idle for extended periods. Without proper coordination and commitment from the industry, the effectiveness of workplace

screenings is significantly impacted. Strengthening collaboration and emphasizing the long-term benefits of employee health can help improve participation and industry engagement.

A Health Care Provider said,

"Even after obtaining permission and setting up the camp, employees do not attend. It feels like we are simply sitting idle. Industries do not cooperate; when we request support, they prioritize production over employee health and do not pay attention to us."

iii. Delayed participation of employees

One of the key challenges in conducting workplace health screenings is the delayed participation of employeesdue to shift-based work schedules. Employees arriving for later shifts often delay their participation, impacting the overall efficiency of the screening process. If workers could be encouraged to attend screenings earlier, it would help streamline operations and ensure smoother execution.

Additionally, even after obtaining management approval and setting up screening camps, participation remains low**.** Industries often fail to facilitate or encourage attendance, prioritizing production over employee health**.** As a result, healthcare teams are left waiting with minimal engagement from employees. Without stronger industry cooperation and better coordination, ensuring timely participation remains a significant challenge.

A Health Care Provider said,

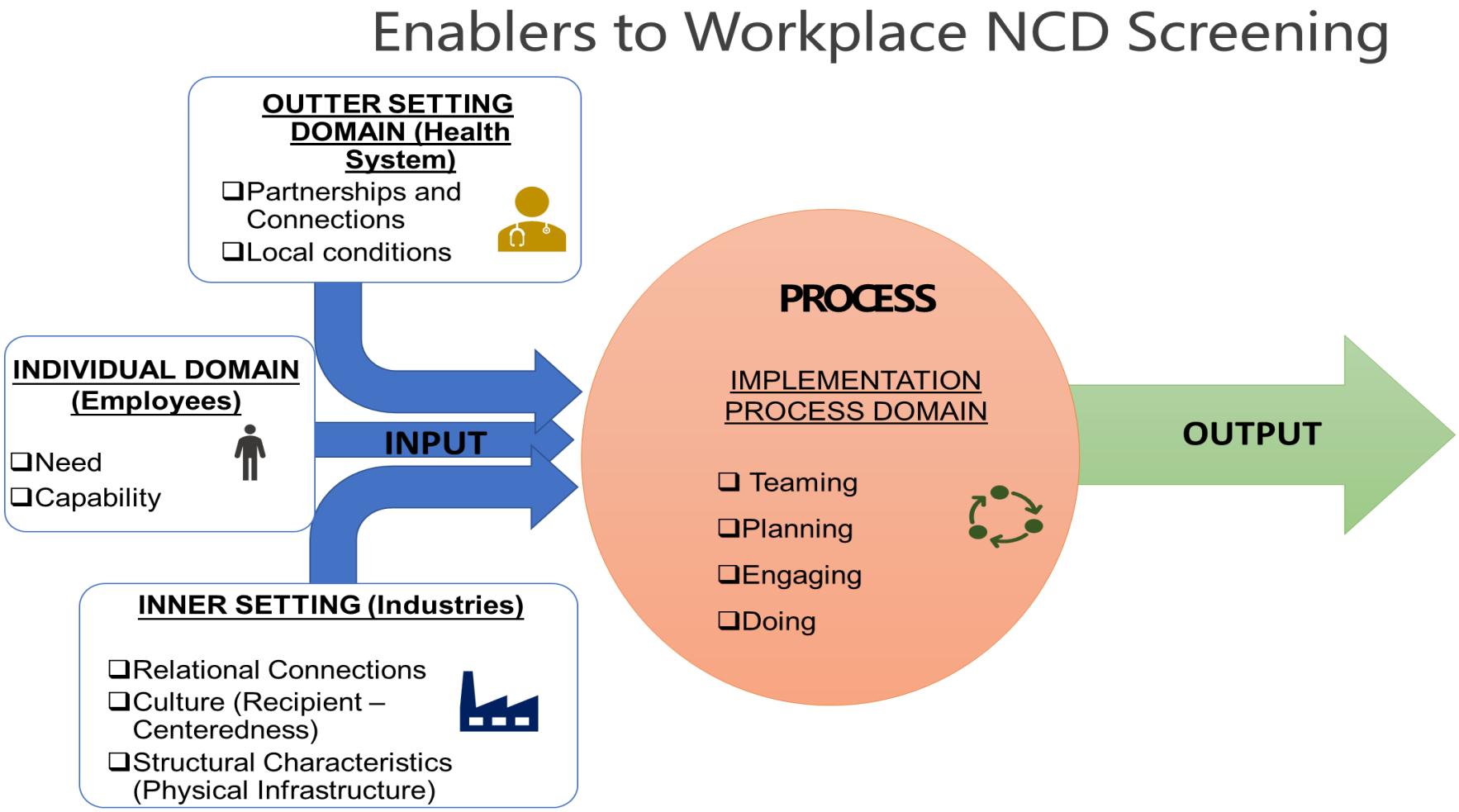
"Since employees arrive at different times based on their shifts, those who come late also tend to participate late. If they could come earlier, it would be more efficient."

A Health Care Provider said,

"Even after obtaining permission and setting up the camp, employees do not attend. It feels like we are simply sitting idle. Industries do not cooperate; when we request support, they prioritize production over employee health and do not pay attention to us."

3.2 Enabling factors of Workplace Screening analyzed using CFIR

Enabling factors are Conditions, resources, or influences that facilitate or promote the successful implementation of an initiative, activity, or process. These factors provide support, motivation, or means to achieve desired outcomes.



3.2.I OUTER SETTINGDOMAIN (Health System)

3.2.I.1 Partnerships and Connections

i. Collaboration between CSR of industries and the health system

Corporate Social Responsibility **(**CSR**)** initiatives have fostered a strong partnership between industries and healthcare providers, enabling better access to healthcare services. Through CSR collaborations, industries contribute by providing essentialresources**,** such as fogging machines for disease prevention and renovating PHCs**,** thereby improving healthcare infrastructure.

This ongoing support has helped establish a positive rapport**,** making it easier to engagewithindustriesandgain access to their workforce for health interventions. Such partnerships enhance workplace health programs**,** ensuring smoother implementation and better outcomes for employee well-being.

A Health Care Provider said,

“So, in everything, the industry has been tied up with us through CSR collaboration. Because of this, they are taking care of various needs, like providing us with fogging machines or renovating the PHCs. They are giving us very good support. This rapport made it easier for us to get inside, and it gave us easier access overall.”

ii. Recommendations of appropriate referral centers and doctors by screening team

While workplace health screenings provide an essential service, there is a gap in ensuring continued care for employees. It would be beneficial if employees were given clearreferrals to nearby healthcare facilitieswhere they could seek further consultation. Instead of limiting treatment to immediate relief through medication, there should be an emphasis on follow-up care and long-term management of health conditions.

Providing guidance on where employees can receive ongoing medical supportwould enhance the effectiveness of workplace health programs. This approach ensures that

screenings do not serve merely as a one-time intervention but contribute to sustained employee well-being through continuous monitoring and treatment.

An Employersaid,

“It would be helpful if they could provide employees with a reference for the nearest place where they can go and consult. They should also focus on ensuring proper follow-up for their treatment rather than just prescribing tablets or medicines for immediate relief. Advising them for follow-up or letting them know where they can visit for continued care would be very useful.”

iii. Networking with ESI team is good enabled for follow-up activities

The collaboration between Primary Health Centers (PHC) and the Employees' State Insurance (ESI)has significantly streamlined the healthcare process for workers. PHCs take charge of initial diagnosis**,** while ESI ensures follow-up care and treatment**,**creatingawell-coordinated system that reduces gaps in medical attention.

This structured approach enhances efficiencyandensures continuity of care, making it easier for employees to access necessary treatment without disruptions. As a result, workplace health initiatives become more effective, minimizing the burden on health care workers while improving employee well-being.

A Health Care Provider said,

“*PHC and ESI are working in coordination here. PHC is responsible for diagnoses and ESI is responsible for follow up. This made our job easier”*

3.2.I.2 Local Conditions

Number of screening days based on employees count

A well-structured approach to organizing health camps plays a crucial role in ensuring maximum participation and effectiveness. The number of camps is planned based on the workforce size of each industry. For instance, industries with 500 employees are allocated

one camp**,** while those with 700 employees require two camps to accommodate all workers.

This strategic allocation of resources ensures that screenings are accessible, well-distributed, and efficiently managed. By tailoring the number of camps to the industry's workforce, organizations can optimize participation ratesandenhance health coverage, making preventive care more accessible to employees.

A Health Care Provider said,

"There are 16 industries in our block. We arrange the camps according to the strength of each industry. For example, if there are 500 employees in an industry one camp will be conducted, and if there are 700 employees, 2 camps will be conducted"

3.2.II INNER SETTINGDOMAIN (Industries)

3.2.II.1 Relational Connections

i. Organizing camps/ health checkups in a preplanned and well-structured manner by the industry

A well-organized approach to health checkups ensures maximum participation and smooth execution. Government support plays a significant role in facilitating these screenings, as seen in past events like BP and sugar checkups conducted through ESI and COVID-19 managementhandled independently. To further streamline the process, nurses and doctors are arrangedto assist with screenings.

Additionally, the adjustments made by employees across different shifts contribute to the effectiveness of the program. Some arrived earlier than usual, while night shift workers completed their checkups before leaving. Even those finishing shifts at odd hours, such as 3:30 AM or 5:00 AM, participated**,** ensuring that all three shifts were covered within a single day**.** This level of planning and cooperation significantly enhances the reach and efficiency of workplace health screenings.

Compliance officer said,

"There is maximum support from the government. For example, the last BP and sugar checkup was arranged through ESI. Similarly, during COVID-19, they managed it themselves. From our side, we arrange nurses and doctors to facilitate the process."

Another response was

"Employees from different shifts adjusted their timings. Some came earlier than usual, arriving at 7:30 AM, and night shift workers completed their checkups before leaving by 8:00 AM. Those finishing their night shift at 5:00 AM or 3:30-3:40 AM also made use of the screening. This ensured that all three shifts were covered within a single day."

ii. Assistance from the OHC team in conducting screenings

The support of the Occupational Health Centre (OHC) team is crucial for the smooth execution of health screenings in industries. Cooperation from the OHC doctor and staff can significantly speed up the process, ensuring that screenings are conducted efficiently.

For example, in a industry, the OHC doctor's cooperation helped complete the work quickly. This highlights the importance of collaborative efforts between external teams and in-house OHC staff. Since the external team alone cannot manage the entire process, active involvement from the OHC team is essential to ensure successful screenings.

A Health Care Provider said,

"If the OHC doctor cooperates well, we can get things done. When you went to Unit 2, the doctor there was very cooperative, and the work was completed quickly. Our team alone cannot finish the task; the OHC staff there also need to provide their support"

3.2.II.2 Culture (Recipient-Centeredness)

Management that actively supports employee wellness and health

Strong management support plays a vital role in promoting employee health and wellness. When the leadership is proactive in facilitating health camps, it ensures better participation and accessibility for employees.

For instance, the management has expressed a willingness to organize and support health camps**,** whether internally or through external collaborations. Their commitment to employee well-being creates a positive environment where health initiatives can be implemented effectively. This level of involvement ensures that necessary resources and arrangements are in place to encourage employee participation in wellness programs.

An Employer said,

"If you personally want to organize a health camp, we fully support it. Externally? We are more than willing to arrange it."

Another Employersaid,

"The management provide good support."

3.2.II.3 Structural Characteristics (Physical Infrastructure)

Presence of OHCfor Workplace Health Initiatives

A well-structured workplace health infrastructure plays a crucial role in the successful implementation of health initiatives. Key factors such as proactive planning, strong administrative management, employee cooperation, and sufficient funding contribute to an effective health program. When these elements are in place, industries can seamlessly conduct health screenings and wellness programs. A dedicated infrastructure ensures that employees have access to necessary medical facilities, making workplace health initiatives more efficient and impactful.

A dedicated space for screenings is crucial for smooth execution and employee participation. Industries with Occupational Health Centers (OHCs) often use them for screenings, ensuring privacy and efficiency. If an OHC is unavailable, screenings are arranged in conference rooms or designated temporary areas with essential medical facilities. Some industries set up mobile health units or flexible screening zones to ensure accessibility for all employees. These locations are chosen strategically to minimize workflow disruptions while encouraging participation.

To accommodate shift workers, screenings are scheduled at flexible hours, allowing employees from all shifts to attend. A well-planned infrastructure ensures seamless health checkups, boosting overall workplace wellness.

A Health Care Provider said,

"Main reason is eagerly planning. The facilitated like administrative management, employee cooperation, best infrastructure, and funding."

3.2.III INDIVIDUAL DOMAIN (Employees)

3.2.III.1 Need

Personal Interest from Employees

Employees have shown a strong willingness to participate in health screenings, demonstrating their personal interest in maintaining their well-being. Many voluntarily come forward to undergo screenings, ensuring they take advantage of the free services provided. Even those who are unable to attend on-site screenings take the initiative to get tested elsewhere and submit their results.

Additionally, employees exhibit patience and commitment by waiting in line for their turn, reflecting their proactive approach toward health check-ups. The advance communication through the HR department further supports participation, as employees respond positively once informed. This level of engagement highlights their awareness of the importance of regular health monitoring.

An OHC SN said

"Employees voluntarily come forward and participate with interest. We conduct the screenings free of charge, but if they are unable to attend, they get tested elsewhere and submit their results to us. They also patiently wait in line for their turn. We always ensure that the HR department is informed in advance, and once the information is shared, employees make it a point to attend the screening."

3.2.III.2 Capability

Support from employees

Employee participation is a crucial factor in the success of workplace health screenings. While teamwork and industry cooperation play significant roles, the willingness and engagement of employees ultimately determine the effectiveness of these initiatives. Without active participation, even well-organized screenings may not yield the desired outcomes.

Industries facilitate the process by granting permission and making necessary arrangements, but the success of the screening depends on employees utilizing the opportunity. Their cooperation in attending screenings, following the recommended health guidelines, and encouraging their peers to participate ensures a smooth and impactful health intervention. Therefore, employee support remains a key driving force behind the overall success of workplace health programs.

A Health Care Provider said

"First, our teamwork is the key factor. Then, the most important aspect is the cooperation of the industrysince they provide permission and make all the necessary arrangements, we are able to carry out our work smoothly. Finally, the support of the employees plays a crucial role. These are the main reasons for our success."

3.2.IVIMPLEMENTATION PROCESS DOMAIN

3.2.IV.1 Teaming

i. Collaboration between PHC, ESIC Teams and Industries

The coordination between Primary Health Centers (PHC) and the Employees' State Insurance Corporation (ESIC) plays a crucial role in ensuring effective workplace health screenings. PHCs focus on initial diagnosis and screening, identifying health concerns among employees at an early stage.

Once diagnosed, ESIC takes responsibility for follow-up care and treatment, ensuring that employees receive the necessary medical attention and ongoing health support. This division of responsibilities allows for a structured and continuous healthcare approach, preventing gaps in treatment and improving overall employee well-being.

By working together, PHC and ESIC streamline the screening process, making healthcare services more accessible and efficient for workers while minimizing disruptions to their daily routines. This partnership strengthens workplace health initiatives and promotes long-term employee wellness.

A Health Care Provider said,

"PHC and ESI are working in coordination here. PHC is responsible for diagnoses and ESI is responsible for follow-up."

ii. Co-operation of entire medical team

The successful completion of Non-Communicable Disease (NCD) screening is possible due to the combined efforts of the entire medical team**.** From initial planning to execution, each member plays a vital role in ensuring smooth operations. Doctors, nurses, technicians, and support staff work together to streamline the process, minimizing delays and maximizing efficiency. Their coordination ensures that screenings are conducted

systematically, allowing employees to receive proper diagnoses and necessary follow-ups.

A well-coordinated team not only enhances the effectiveness of screenings but also builds trust and participation among employees**.** When healthcare professionals actively collaborate, it creates a supportive environment that encourages employees to prioritize their health. This level of cooperation is essential in maintaining a structured and efficient screening process within the workplace.

A Health Care Provider said,

"The reason for successfully completing the NCD screening is everyone's cooperation, entire medical team"

3.2.IV.2Planning

Strong collaboration between management and employees

Intra-coordination within the organization, specifically between management and employees**,** plays a pivotal role in ensuring the success of health initiatives. Participants highlighted that effective planning, strong communication, and cooperation between different organizational levels lead to successful health screenings. This statement underscores the significance of organizational planning, management support, and employee collaboration in facilitating workplace health programs. When both management and employees work together with shared goals, it creates a seamless process for implementing health interventions. Additionally, the combination of good infrastructure and adequate funding further enhances the effectiveness of these programs.

3.2.III.3Engaging

i. **Innovation Deliverers**

Maintaining good rapport with Stake holders

Previous collaborations, such as during the COVID-19 vaccination drive, have strengthened the rapport between industries and healthcare teams. This pre-established understanding makes coordination easier and facilitates a more efficient screening process**.** With a well-established relationship, approaching HR, GMs, and other staff members becomes more convenient, ensuring better participation. Additionally, the flexibility of the medical team in accommodating different shift timings helps overcome scheduling challenges and ensures that all employees benefit from the screening.

A Health Care Provider response was,

"We already had experience working with them during the COVID vaccination drive. So, we had a good understanding with the company. Because of that understanding, the workplace screening became much easier for us. We're not new to the company; we already worked with them and provided vaccinations to all the staff during the COVID period. Because of this strong relationship, approaching the HR, GM, and all the staff became much easier, and they are very close to us. We can finish the screening easily. If there's a slight backlog, we will handle it. Whether it's the morning shift or afternoon shift, we are ready to do it for them, and that's how we can complete the work quickly."

ii. Innovation Recipients

Relationship and Coordinating with Industries to plan in advance

Building and maintaining strong relationships with industries is crucial for the smooth execution of workplace screenings. Since industries prioritize maintaining productivity, health screenings must be planned in a way that does not disrupt their workflow. To achieve this, constant communication and advance planning with industry representatives, including HR and management teams, are essential. By discussing

schedules and aligning expectations, both the healthcare team and the industry can collaborate effectively to ensure a seamless screening process.

A Health Care Provider said,

"From the industry's side, they also want to ensure that their work and production are not affected in any way. No one thinks otherwise. So, we always discuss with them in advance and plan accordingly. We used to have a very good plan, madam, maintaining good rapport, relationships, and coordination with the industries."

3.2.IV.4Doing

Raising Awareness prior to the screeningto encourage participation and facilitate the process

Creating awareness before conducting workplace screenings is essential to ensure higher participation rates and a smoother process. Many employees may not fully understand the importance of regular health check-ups or may be hesitant due tolack of information**.** To address this, notices should be distributed well in advance, informing employees about the screening schedule, its benefits, and what to expect. This proactive approach helps in mentally preparing them for participation.

Additionally, training and educating doctors, nurses, and healthcare workersinvolved in the screening process is crucial. When the medical team is well-informed and aligned with the purpose of the screening, they can better communicate with employees and encourage their involvement. Awareness campaigns, informational sessions, and personalized communication can significantly improve participation and ensure the success of workplace health screenings.

A Health Care Provider said,

"Notices should be given to all employees, and education should be provided to doctors and nurses. Awareness needs to be created."

CHAPTER 4

QUANTITATIVE SURVEY RESULTS

4.1 District-wise list of selected industries

The quantitative data was collected from 317 employees working in 30 different industries situated across 10 districts of Tamil Nadu.

The selected 10 districts were as follows:

- Dindigul
- Kanchipuram
- Krishnagiri
- Madurai
- Perambalur
- Tiruchirappalli
- Tiruvannamalai
- Tiruppur
- Tuticorin
- Salem.

Three industries were selected randomly from each of the ten districts. The list of selected industries is provided in the table below.

Table 4.1District-wise list of selected industries

DISTRICT	INDUSTRIES
DINDIGUL	Vedha spinning mills Private Ltd. Unit-1
	Sri Shanmugavel mills, private Ltd, Unit II
	Sivaraj spinning mills Pvt Ltd.
KANCHEEPURAM	Nippon Paint India Pvt Ltd
	KUSAUTO India Pvt Ltd
	Kone elevators India Pvt.Ltd
KRISHNAGIRI	First step baby wear

	Bimetal
	Carborundum universal industry
MADURAI	GHCL mills
	Manna Foods Pvt ltd
	Fenner India limited
PERAMBALUR	Perambalur Sugar mills
	MRF Tyres
	DhanalakshmiSreenivasan Sugars (P) Ltd
SALEM	Hatsun
	Indian petroleum
	Indian oil
TIRUPPUR	Sakthi Auto Components
	KPR Garments and apparels limited
	KPR Mill Limited
TIRUVANNAMALAI	Rockman industries
	Lotus Footwear Enterprises Ltd.
	Schwing Stetter India Pvt Ltd
TRICHY	Dalmia Cements (Bharath) Ltd
	GHC Limited
	Color Jersey
THOOTHUKUDI	Ashwini Fisheries Ltd.,
	D.C.W. Limited,
	Madura Coats Pvt Limited,

4.2Organization characteristics pertaining to employees' wellness

The table below presents the characteristics of the industries, with a focus on the practices related to employees' health and wellness. The availability of diabetic and hypertension friendly food and snacks, gym facility, walking tracks, and the initiatives such as conducting yoga or Zumba classes, providing education/information on screening programs, mandatory screening and the regularity of screening programs were identified and reported for the thirty industries from which the data were collected.

This data was obtained from the quantitative survey responses, any discrepancies in the responses among employees working in the same industry was resolved by checking with the qualitative interviews.

Table 4.2 Organizational characteristics (n=30)

CHARACTERISTICS	CATEGORIES	FREQUENCY	(%)
Availability of diabetes-friendly food		5	16.7%
Availability of diabetes-friendly snacks		6	20.0%
Availability of hypertension-friendly food		4	13.3%
Availability of hypertension-friendly snacks		4	13.3%
Gym availability		2	6.7%
Presence of walking tracks		6	20.0%
Yoga/ zumba/any other program conducted		4	13.3%
Mandatory screening performed		24	80.0%
Frequency of screening programs	Occasionally	1	3.3%
	Annually once	9	30.0%
	Every 6 months once	12	40.0%
	Every 3 months once	8	26.6%
Education on screening from company	Yes	19	63.3%

4.2.1 Availability of healthy food and snacks

Among the 30 included industries, it was observed that in 5 (16.7%) industries diabetes friendly food was available in the canteen. And in 6 (20%) industries diabetes friendly snacks were available. Four industries (13%) reported having hypertension friendly food and snacks in their canteen. These findings are displayed in table 4.2

4.2.2 Fitness and wellness facilities

The presence of fitness/wellness facilities and implementation of wellness programs was assessed across the 30 industries. Two industries (6.7%) reported the availability of Gym in their campus. Six industries (20%) had the tracks for walking. And four industries (13.3%) oraganized wellness programs such as yoga and Zumba classes for their employees.

4.2.3 Screening practices

Most of the industries (80%) implemented mandatory screening. While in the remaining 20% of the industries screening was not made mandatory. The frequency of screening varied among the 30 industries with about 40% industries conducting screening programs once in every six months, and 30% oraganized it once in a year. 23.3% industries arranged these programs once in every 3 months. 3.3% industries conducted occasional screening camps.

4.3 Demographic characteristics of the participants

Table (4.3) presents the demographic characteristics of the participants. The attributes namely age, gender composition, state of residence, marital status, educational qualification, employment status, department of work and years of experience are listed.

Table 4.3Demographic characteristics of the participants (n=317)

CHARACTERISTICS	CATEGORIES		PERCENTAGE
AGE	Below 30	99	(31.2%)
	31-40	127	(40.1%)
	41-50	56	(17.7%)
	Above 50	35	(11.0%)
GENDER	Male	158	(49.8%)
	Female	159	(50.2%)
STATE	Tamil Nadu	303	(95.6%)
	Odisha	10	(3.2%)

	Jharkhand	2	(0.6%)
	Andhra Pradesh	1	(0.3%)
	Karnataka	1	(0.3%)
MARITAL STATUS	Married	240	(75.7%)
	Unmarried	77	(24.3%)
HIGHEST EDUCATIONAL QUALIFICATION	Illiterate	19	(6.0%)
	Primary (class 1-5)	38	(12.0%)
	Secondary (class 6-10)	94	(29.7%)
	Higher Secondary (class 11-12)	52	(16.4%)
	Certificate course	27	(8.5%)
	Diploma	25	(7.9%)
	Undergraduate post-graduate and above	62	(19.6%)
EMPLOYMENT STATUS	Full-time	241	(76.0%)
	Part-time	76	(24.0%)
DEPARTMENT OF WORK	Administrative	37	(11.7%)
	Non-administrative	280	(88.3%)
TOTAL YEARS OF WORK EXPERIENCE	0-5	137	(43.2%)
	6-12	89	(28.1%)
	13-37	87	(27.4%)
	Above 38	4	(1.3%)

4.3.1 Participants Age distribution

The mean age was 36.18 years with a standard deviation of 9.97 years.Mostof the participants were between 31-40 years (40.1%), followed by those below 30 years (31.2%). 17.7% of the participants were between 41-50 years, while the remaining 11% were above the age of 50 years.

4.3.2 Gender of the participants

Among the 317 respondents, almost equal number of male and female were present. With 49.8% male (158) and 50.2% female (159).

4.3.3 State of Residence

A vast majority of participants (95.6%) were from Tamil Nadu, with only 4.4% coming from other states. Among the other state participants most were from Odisha (3.2%), and very few from Jharkhand (0.6%), Andhra Pradesh (0.3%) and Karnataka (0.3%)

4.3.4 Marital status of the participants

The marital status of the participants is shown in table 1. More than three-fourths of the participants (75.7%) were married, while the remaining 24.3% were unmarried.

4.3.5 Highest educational qualification of the participants

The participants had diverse educational backgrounds. Around 30% had completed their secondary education, and about 20% had an undergraduate degree or above. 16.4% had done higher secondary, 12% had done primary schooling. A smaller percentage were illiterate (6.0%). Furthermore, 8.5% had pursued certificate courses, and 7.9% had obtained diplomas.

4.3.6 Employment Status

Most participants (76.0%) were employed in full-time positions, while the remaining 24.0% worked part-time.

4.3.7 Department of Work

A significant majority (88.3%) of the participants were from non-administrative department whereas 11.7% worked in administrative positions as shown in table

4.3.8 Work Experience

The total years of experience varied widely. The highest proportion (43.2%) had 0-5 years of experience, followed by 28.1% with 6-12 years of experience. About 27.4% had

13-37 years of experience, and a very small proportion (1.3%) had more than 38 years of experience.

4.4 Respondent's Nature of work

Table 4.4Respondent's Nature of work (n=317)

CHARACTERISTICS	CATEGORIES	FREQUENCY	PERCENTAGE
SHIFT TIMINGS	General shift	178	56.2%
	Rotational shift	139	43.8%
OVERTIME	Yes	66	20.8%
	No	167	52.7%
	NA	84	26.5%
VIGOROUS INTENSITY ACTIVITY	Involved	57	18.0%
	Not involved	260	82.0%

4.4.1 Shift timings of respondents

The respondents had two types of shift schedules general shift, and rotational shift. Most were from the general shift (56.2%) and the others were from rotational shift (43.8%).

4.4.2 Working overtime

Among the 317 respondents 26.5% mentioned that they do not have an option to work overtime. Out of the remaining 233 members who had an opportunity to work overtime 52.7% said that they do not engage in overtime work, while 20.8% said that they would work overtime.

4.4.3 Vigorous intensity activity

18% of the respondents stated that their job involves vigorous-intensity activity like carrying or lifting heavy loads, digging, or construction work that causes large increases in breathing or heart rate. However, the majority 82% were not involved in any such activities.

4.5 Workplace Screening Participation

4.5.1 Participation in screening

The participation status was assessed among 249 respondents. The employees who were previously diagnosed with diabetes or hypertension were excluded because they are more likely to participate to monitor their blood sugar or blood pressure level. This exclusion ensures the identification of actual percentage of active participation. As shown in the chart below 91% had previously participated in workplace screening programs, however 9% had not participated previously in any workplace screening programs.

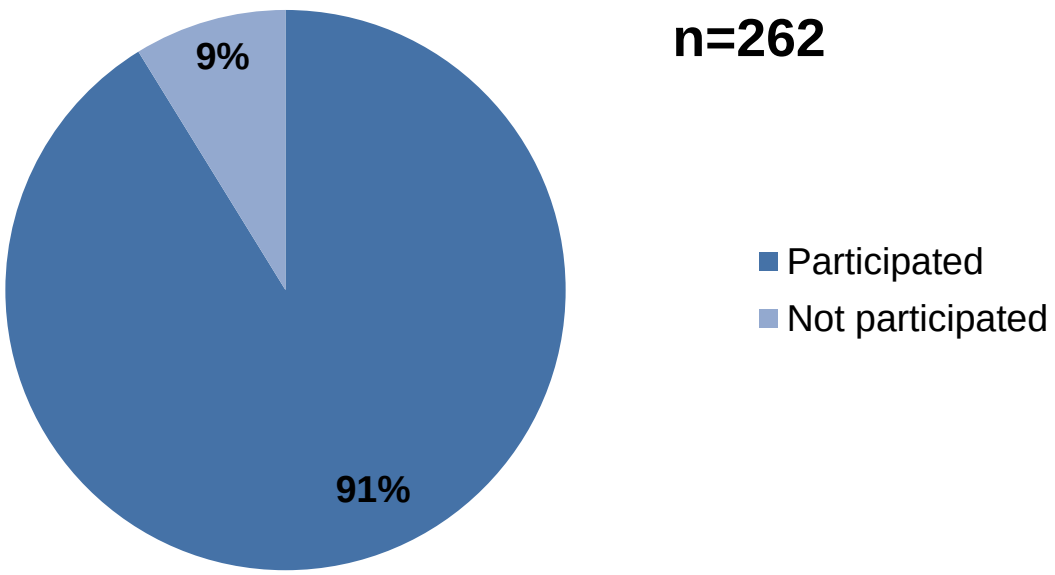


Figure 4.1 Participation in screening

4.5.2 Participation status categorized by age

The status of participation in workplace screening across age groups is presented in the figures below.Figure 4.2 displays the percentage of participants among employees below 35 years. Out of the 133 employees under 35 years who had not been previously diagnosed with diabetes or hypertension 88% (117) had participated in the workplace

screening, whereas the remaining 12% had not participated in any workplace screening earlier.

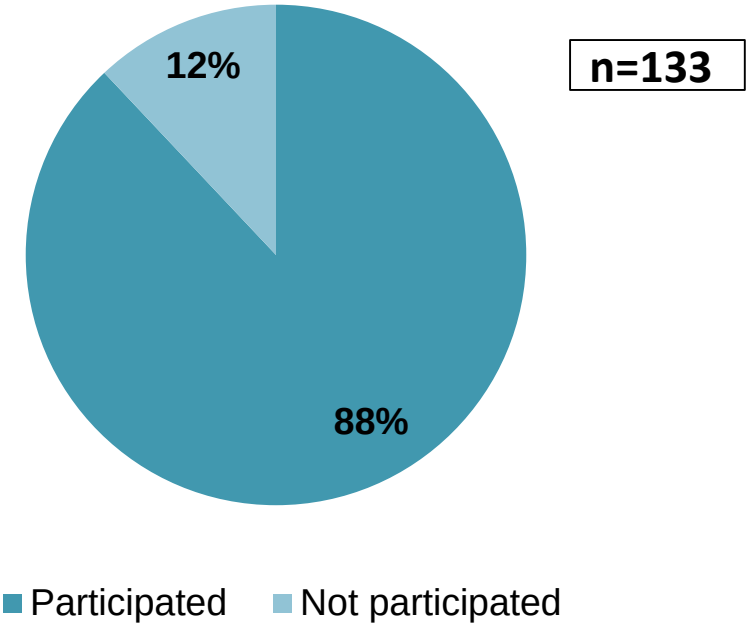


Figure 4.2 participants among employees below 35 years of age

Among the 116 employees over 35 years of age, 94% had previously participated in workplace screening and remaining 6% had not participated in any workplace screening programs before. This is depicted in the 4.3.

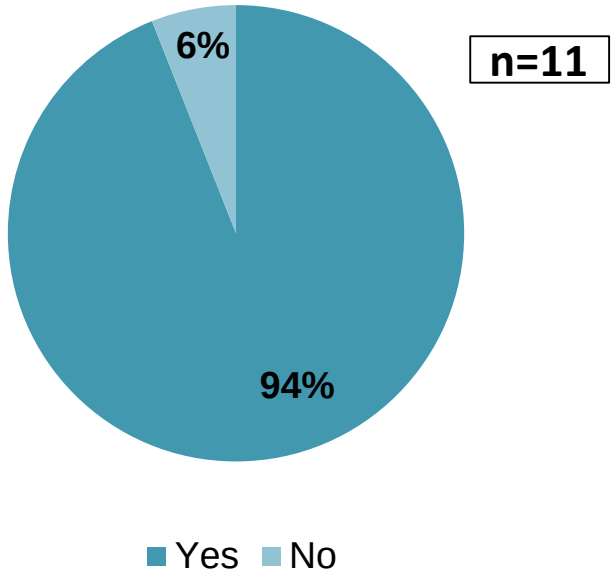


Figure 4.3 Participants among employees above 35 years of age

4.5.3 Lifestyle change made after NCD screening

Among the 295 respondents who had previously participated in workplace screening, 23.8% reported that they had made some lifestyle changes after attending the screening program.

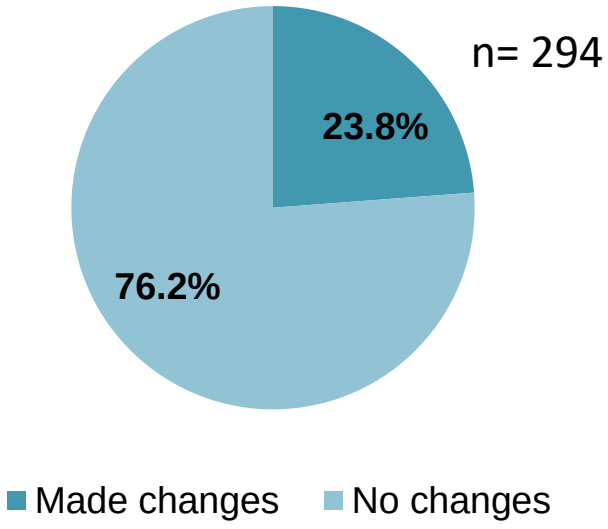


Figure 4.4 Lifestyle change made after NCD screening

4.5.4 Lifestyle changes made after being diagnosed with diabetes at workplace

Out of the 15 respondents who were diagnosed with diabetes at a workplace screening program 93.3% revealed that they had made some lifestyle changes after the screening program.

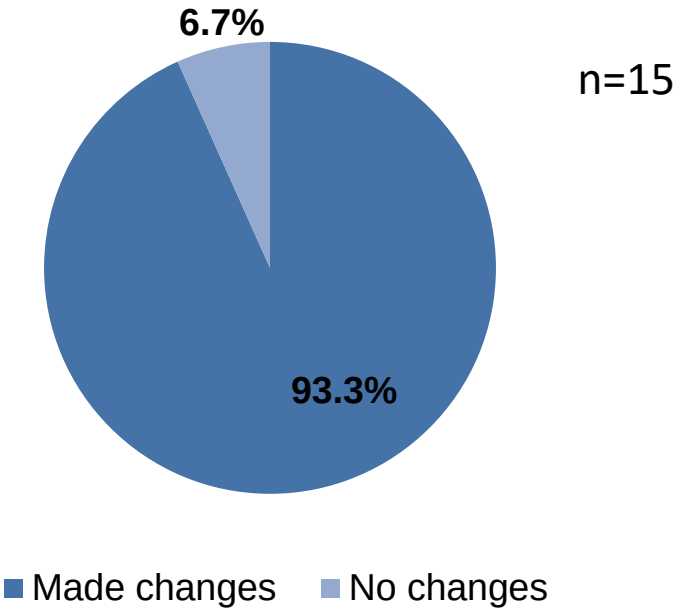


Figure 4.5Lifestyle changes made after being diagnosed with diabetes at workplace

4.5.5 Lifestyle changes made after being diagnosed with hypertension at workplace

Out of the 15 respondents who were diagnosed with hypertension at a workplace screening program 60% revealed that they had made some lifestyle changes after the screening program.

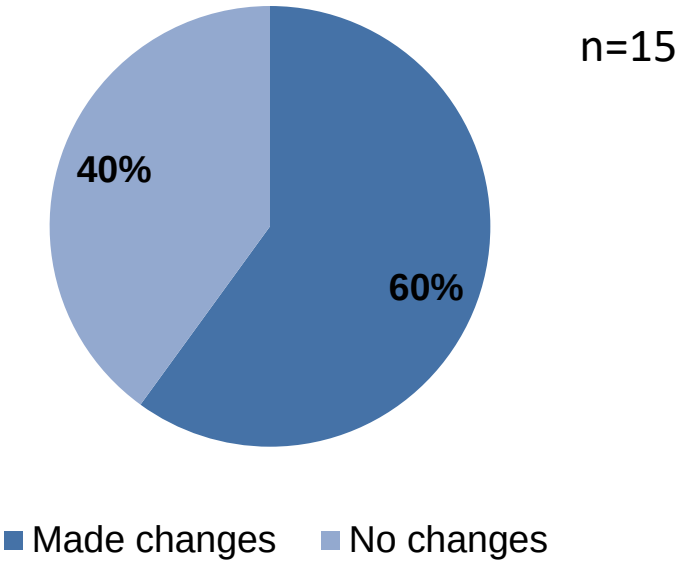


Figure 4.6 Lifestyle changes made after being diagnosed with hypertension at workplace

4.6.Participants health status and practices

4.6.IRespondents' Health insurance coverage

Of the 317 participants, as depicted in Figure 4.7 73.5% were covered by a health insurance (n=233), while the remaining 26.5% (n=84) did not have any health insurance coverage.

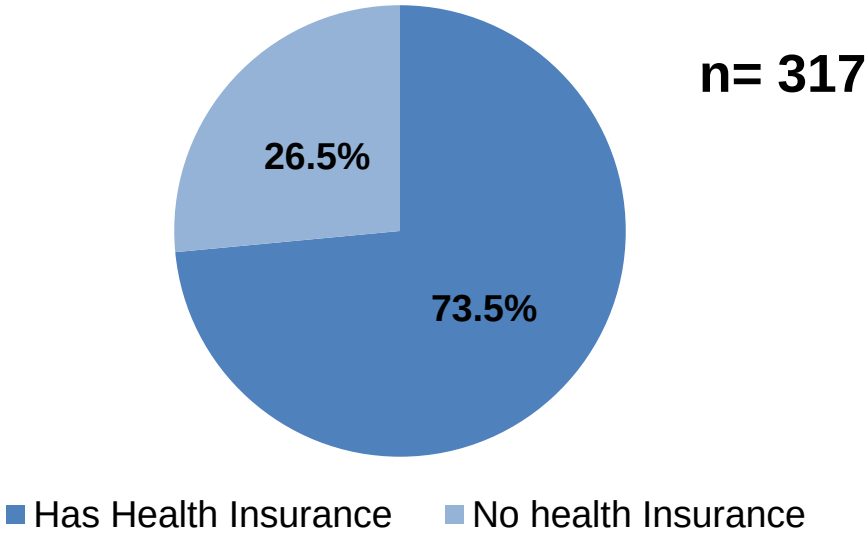


Figure 4.7 Respondents' Health insurance coverage

4.6.IIType of Health Insurance

Among the 233 employees who had a health insurance, company-based insurance and private insurance were the sources of coverage. Majority (91%) of the participants had a company-based insurance. And the rest 9% had a private health insurance covered.

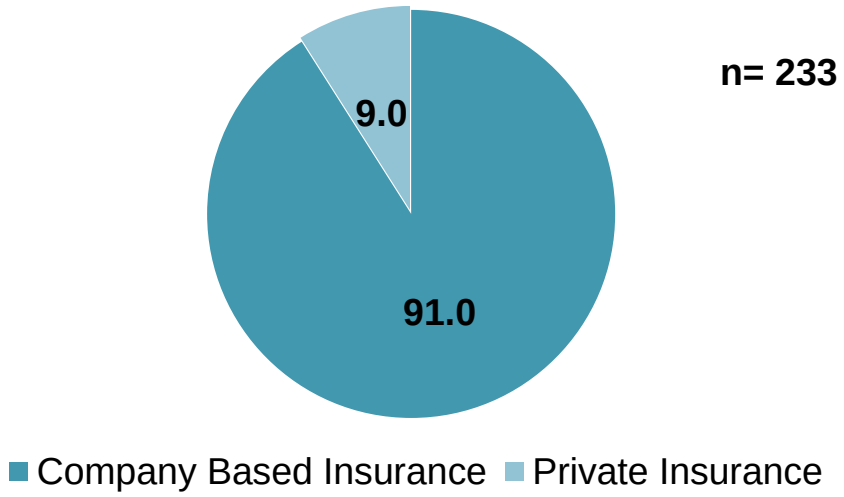


Figure 4.8 Type of Health Insurance

4.6.IIIDiagnosed with diabetes

Prevalence of Diabetes

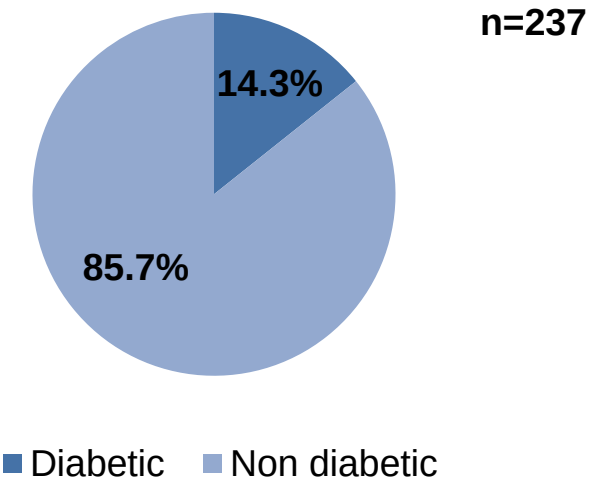


Figure 4.9a Prevalence of diabetes among the respondents

The prevalence of Diabetes was found to be 14.3% among 237 respondents. Employees who are Below 35years of age with no family history of HTN/DM were excluded.

Proportion of Diabetes

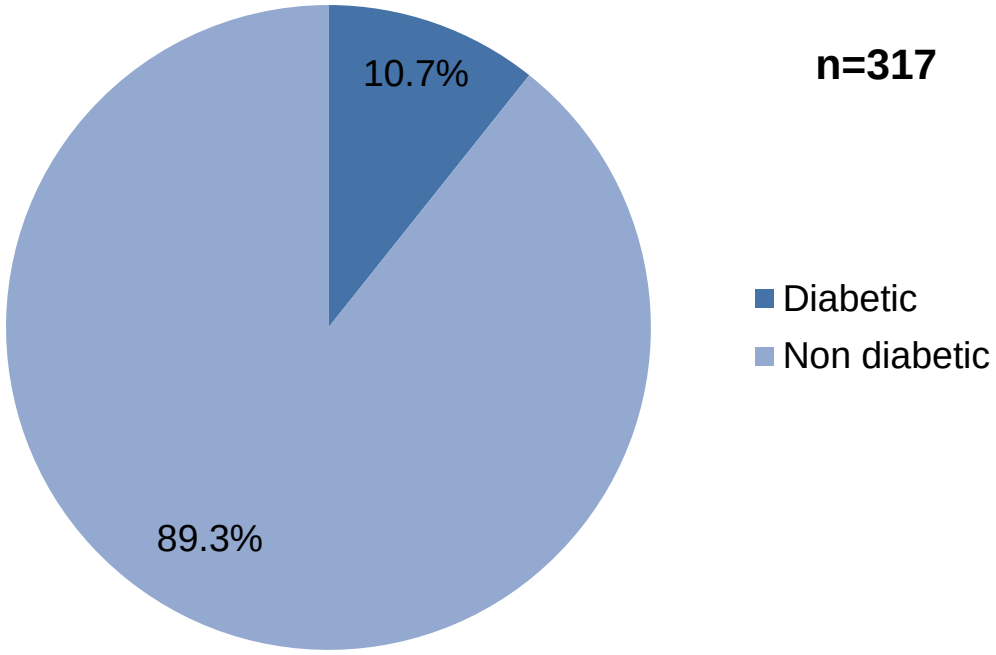


Figure 4.9b Proportion of diabetes among the respondents

10.7% of 317 respondents reported having been previously diagnosed with diabetes. The prevalence of diabetes among those below 35 years and those above or equal to 35 years of age are shown in the figures 4.10a and 4.10b respectively. Out of the 140 participants under the age of 35 years, two (1.4%) were found to be diabetic. And among those above 35 years, 32 of them reported as already diagnosed with diabetes.

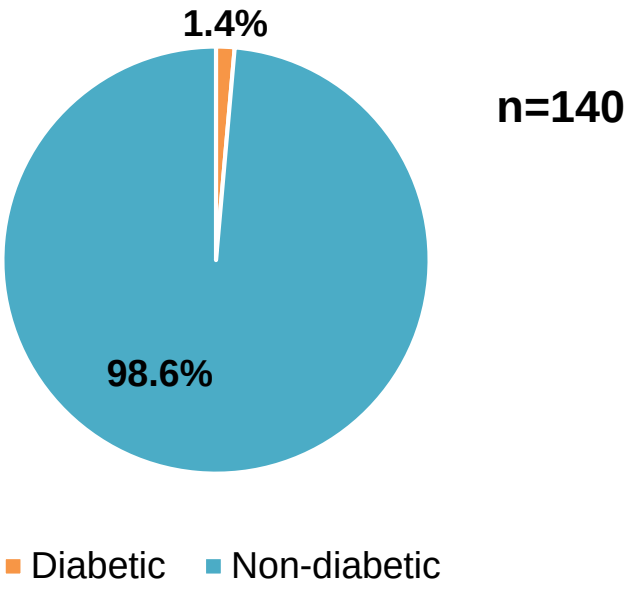


Figure 4.10a Prevalence of diabetes among employees below 35 years of age

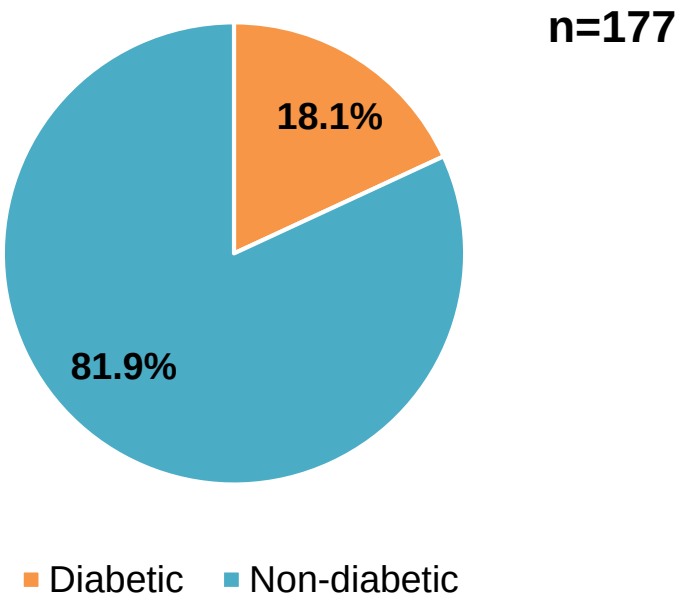


Figure 4.10b Prevalence of diabetes among employees above 35 years of age

4.6.III.1Place of diabetes detection

The place of diabetes detection, among the 34 employees who were previously diagnosed with diabetes is depicted in the figure 4.6 About half of the proportion were diagnosed at the hospital, followed by 44.1% who were detected at the workplace screening. And a small proportion (5.9%) were detected at the community screening camps.

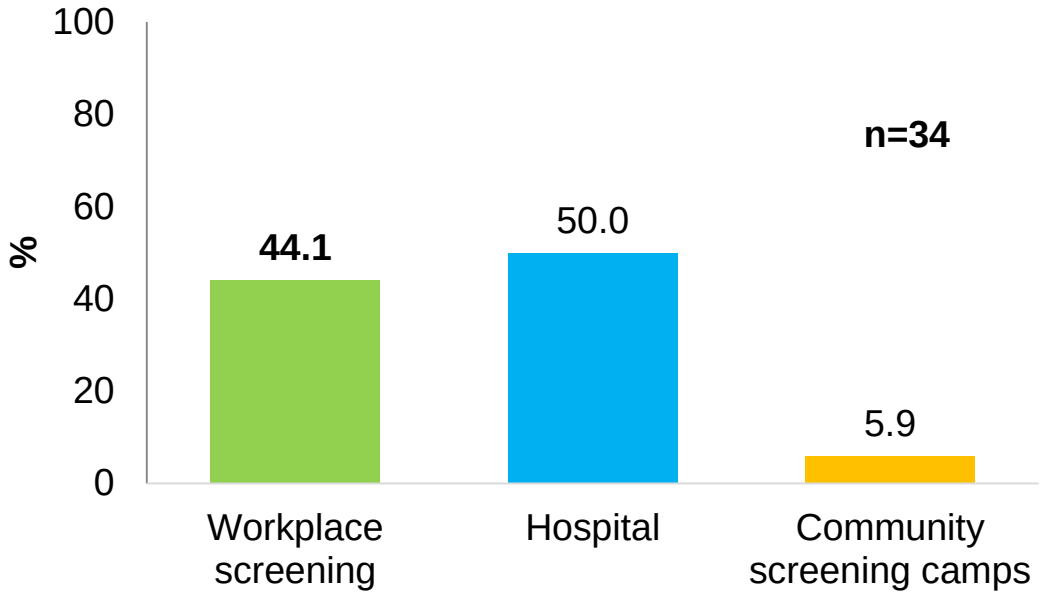


Figure 4.11 Place of diabetes detection

4.6.III.2Place of diabetes detection categorized by age

To identify the differences in diabetes detection sites across age groups, the place of detection was categorized amidst two groups namely those below 35 years of age and those above or equal to 35.

Figure 4.12 shows the place of diabetes detection for those under 35 years. It was found that both the study participants under the age of 35 who had diabetes were first diagnosed at the workplace. This highlights the role of workplace screening in the early detection of diabetes.

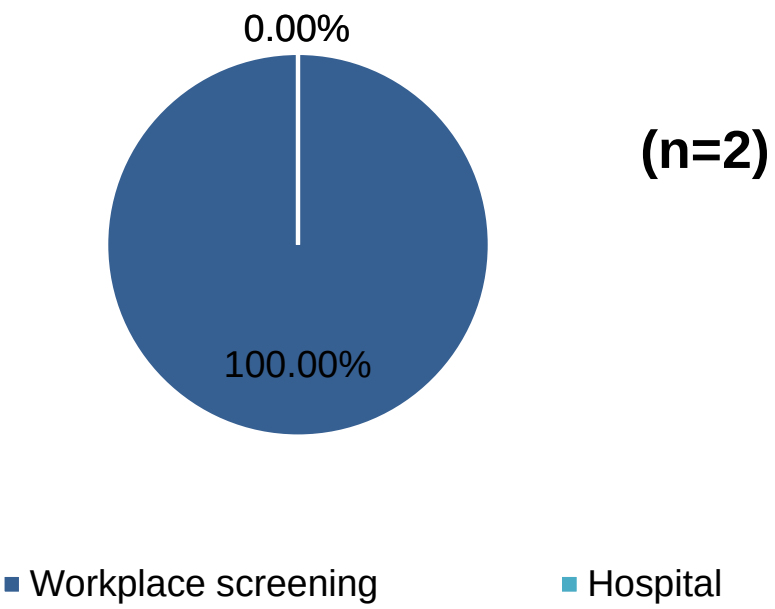


Figure 4.12Place of diabetes diagnosis among employees below 35 years of age

Figure 4.13shows the place of diabetes detection among those above the age of 35. Of the 32 diabetic patients over 35 years, 53.1% were diagnosed at the hospital, and the next highest proportion (40.6%) were diagnosed at the workplace. Very few (6.3%) were identified with hypertension at the community screening camps.

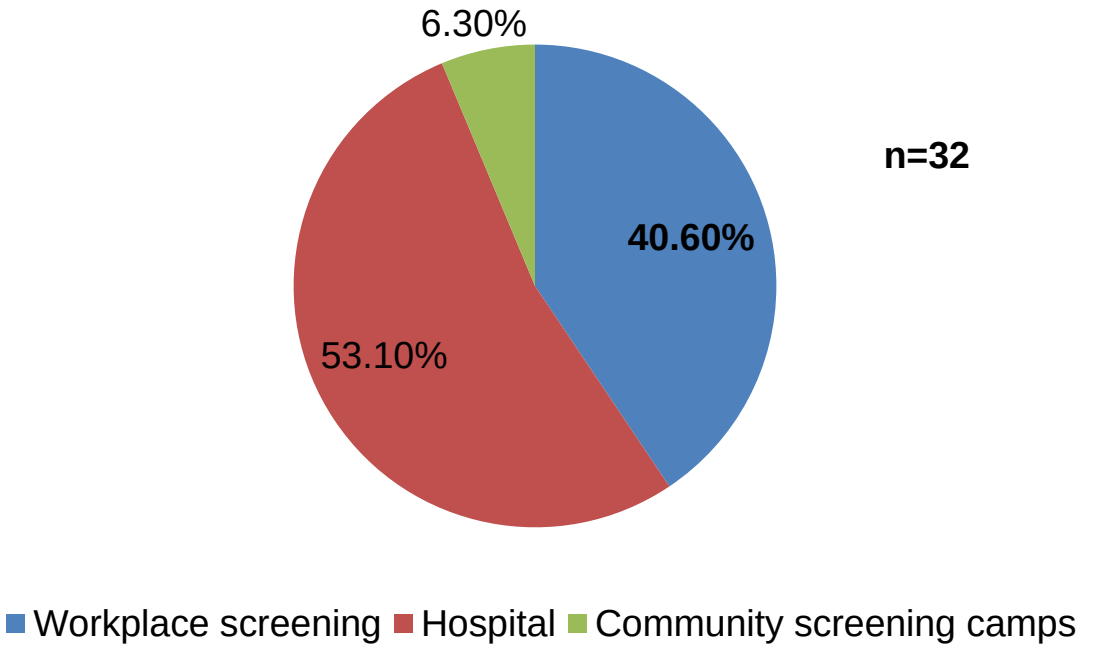


Figure 4.13Place of diabetes diagnosis among employees above 35 years of age

4.6.III.3Life style changes after diabetes diagnosed

85.3% of those who were previously diagnosed with diabetes reported that they made some lifestyle changes after its detection. The remaining 14.7% stated that they did not make any such changes.

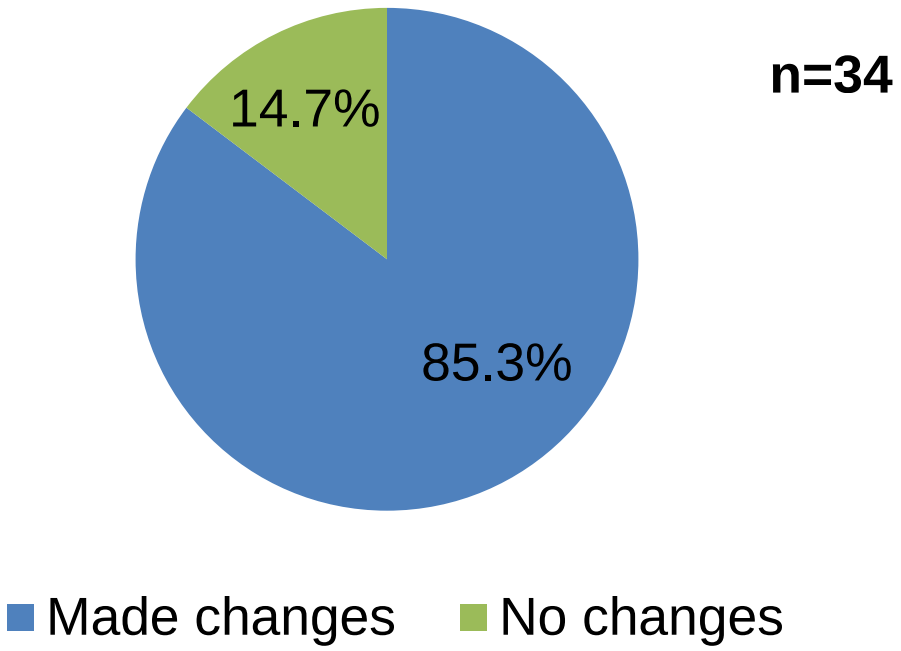


Figure 4.14 Life style changes after diagnosed with diabetes

4.6.III.4Diabetes History, Medication, and Monitoring Practices among Respondents

Table 4.5 Diabetes History, Medication, and Monitoring Practices among Respondents

DIABETES HISTORY/TREATMENT	FREQUENCY	(%)
FAMILY HISTORY OF DIABETES (n=317)	132	41.6
UNDER MEDICATION FOR DIABETES (n=34)	28	82.4
PERIODICALLY MONITORS DIABETES (n=34)	32	94.1

4.6.III.5Family history of diabetes

Among the 317 respondents around 42% of them mentioned that one or more of their family members had been diagnosed with diabetes. This is exhibited in the above table 4.5.

4.6.III.6Under medication for diabetes

82.4% of those who were already diagnosed with diabetes stated that they were under medication. While the remaining 17.6% did not take any medication for their condition. (Table 4.5)

4.6.III.7 Undergoing periodic monitoring for Diabetes

Among the 34 participants with diabetes 94.1% reported that they undergo periodic monitoring for diabetes. The remaining 5.9% stated that they do not periodically monitor their condition.

4.6.III.8Place of treatment among Diabetic patients

The figure below illustrates the place of regular treatment for those with diabetes. More than half of them (52.9%) visited a private facility for their regular treatment, and around 30% made use of the government health facility, while 17.6% took their regular treatment at the workplace.

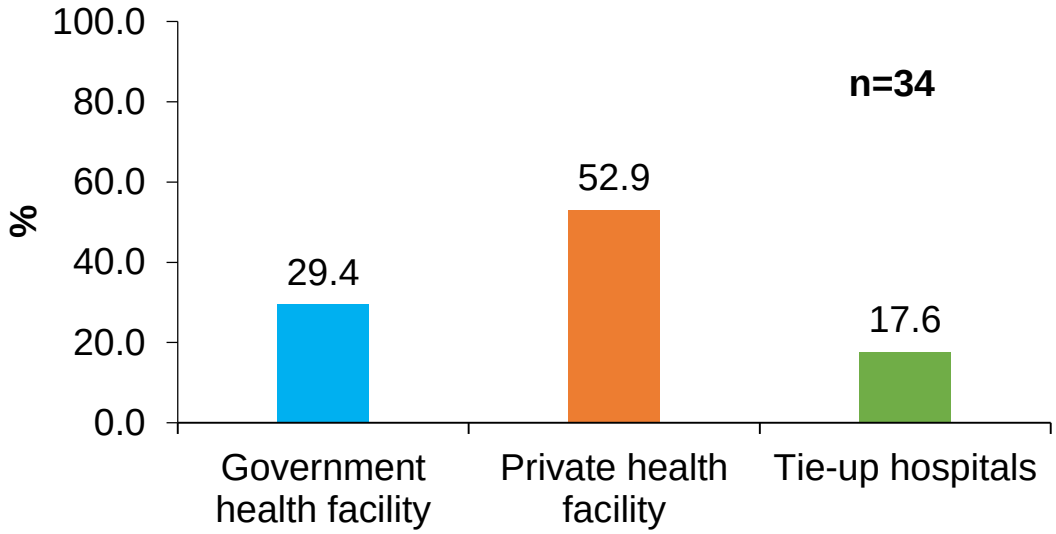


Figure 4.15Place of treatment among diabetic patients

4.6.IV.Diagnosed with hypertension

Prevalence of Hypertension

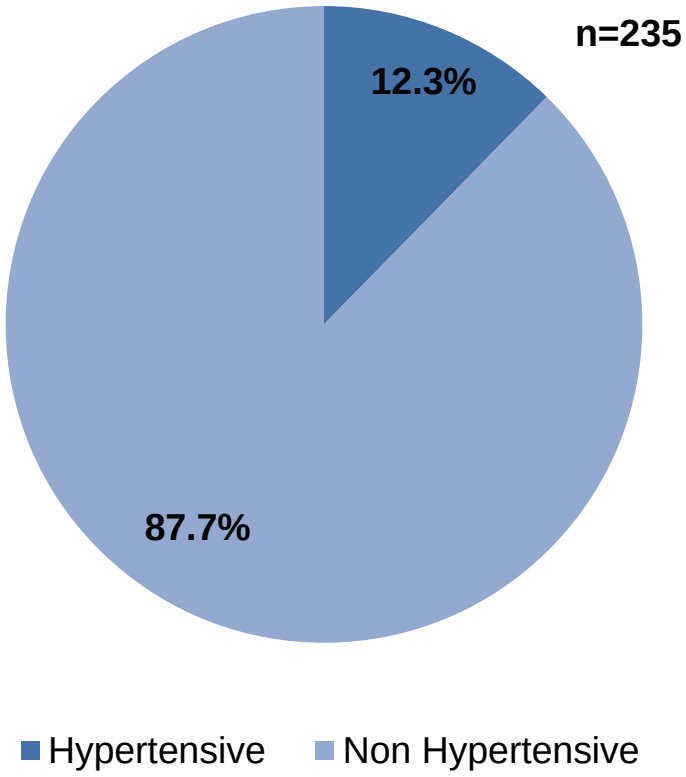


Figure 4.16a Prevalence of hypertension among the respondents

The Prevalence of hypertension is 12.3% among 235 respondents.Employees who are Below 35years of age with no family history of HTN/DM were excluded.

Proportion of Hypertension

9.1% of 317 respondents reported having been previously diagnosed with hypertension as shown in the Figure 4.16b.

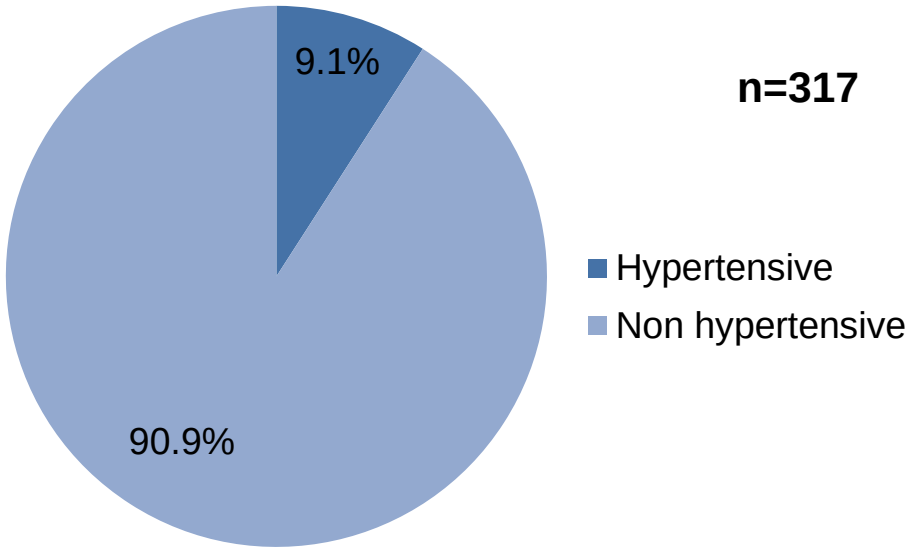


Figure 4.16b Proportion of hypertension among the respondents

Out of the 140 participants under the age of 35 years, 5 (3.6%) were previously diagnosed with hypertension. This is represented in the figure 4.17 and among those above 35 years, 24 (13.6%) of them reported as already diagnosed with hypertension (Figure 4.18)

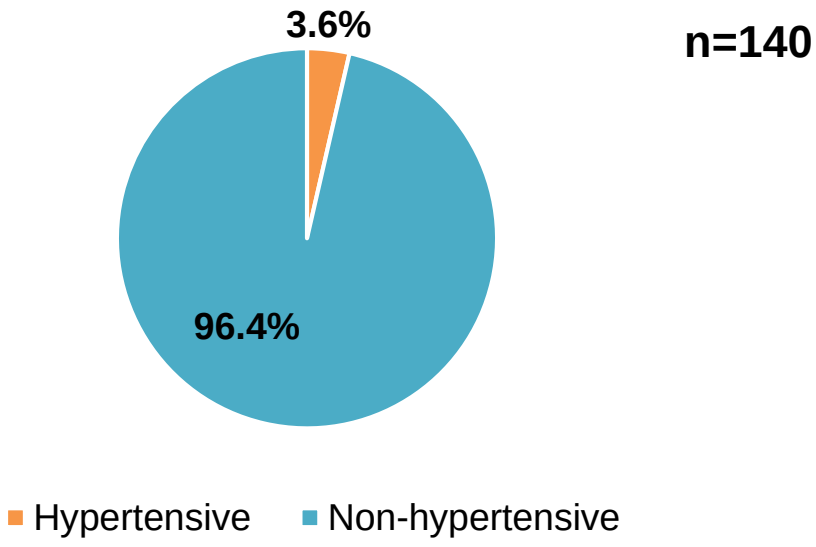


Figure 4.17 Prevalence of hypertension among employees below 35 years of age

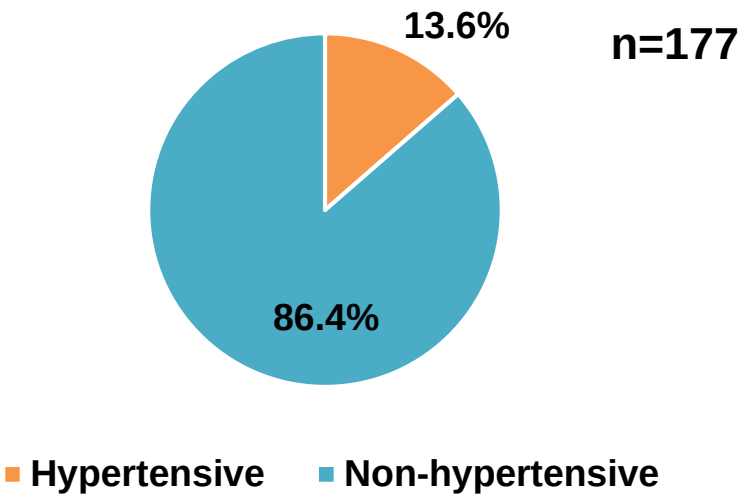


Figure 4.18Prevalence of hypertension among employees above 35 years of age

4.6.VI.1Place of diagnosis (Hypertension)

The place of hypertension detection, among the 29 employees who were previously diagnosed with diabetes is depicted in the figure 4.19. More than half of the proportion were diagnosed at the workplace (51.7%), followed by 44.8% detected at the hospital. And a minimal proportion (3.4%) were detected at the community screening camps.

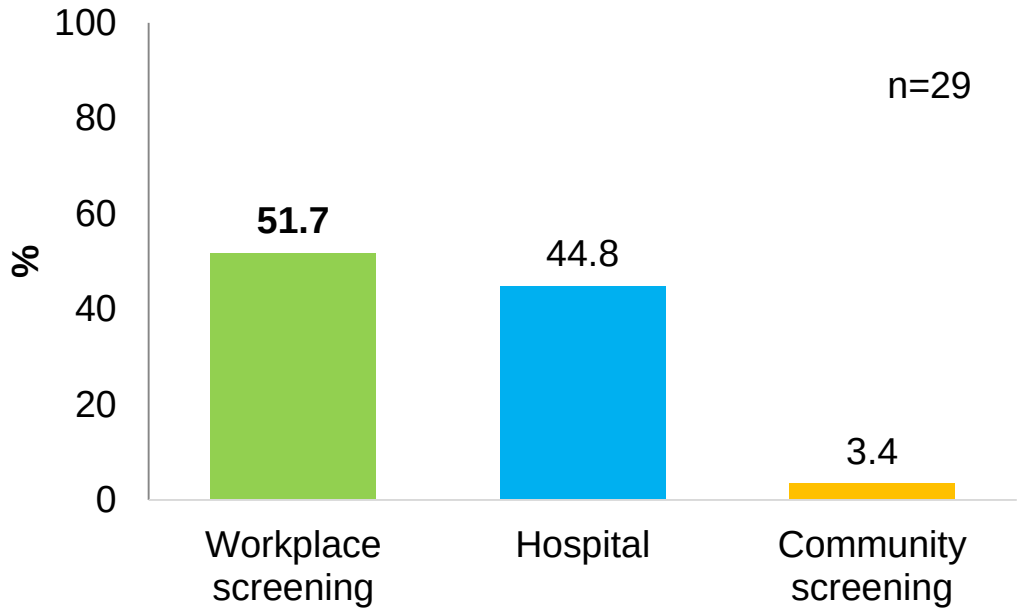


Figure 4.19 Place of hypertension detection

4.6.IV.2Place of hypertension detection categorized by age

To identify the differences in hypertension detection sites across age groups, the place of detection was categorized amidst two groups namely those below 35 years of age and those above or equal to 35.

Figure 4.20shows the place of hypertension detection for those under 35 years. Among the 5 participants with hypertension under the age 35, 60% were first detected at the workplace screening and the other 40% were diagnosed at the hospital.

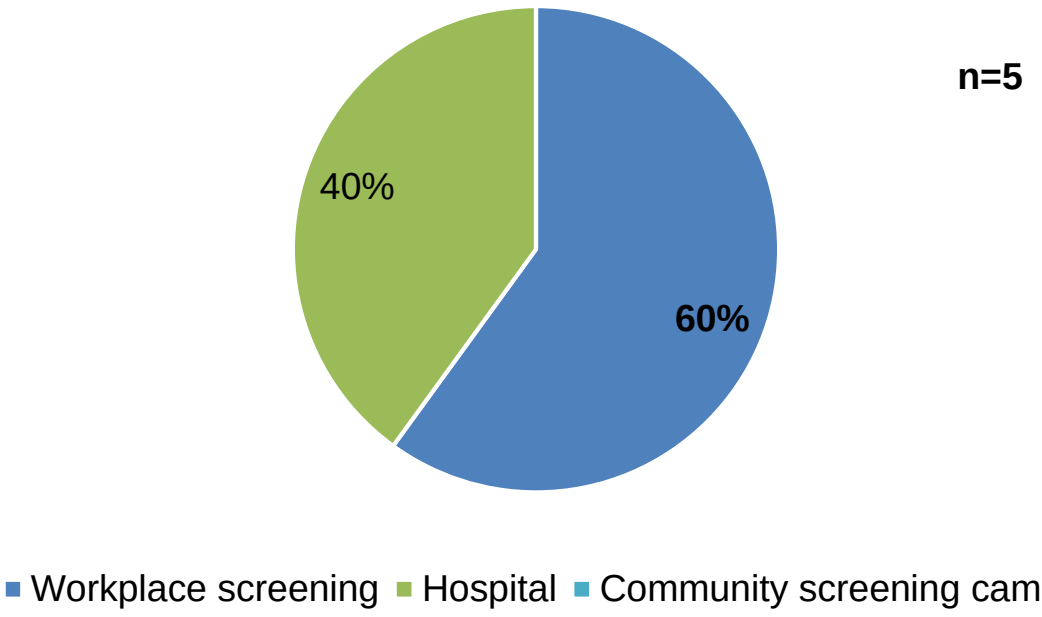


Figure 4.20 place of hypertension diagnosis among employees below 35 years of age

Figure 4.21 shows the place of hypertension detection among those above the age of 35. Of the 24 hypertension patients over 35 years, 50% were diagnosed at the workplace, and 45.8% were diagnosed at the hospital. Very few (4.2%) were identified with hypertension at the community screening camps.

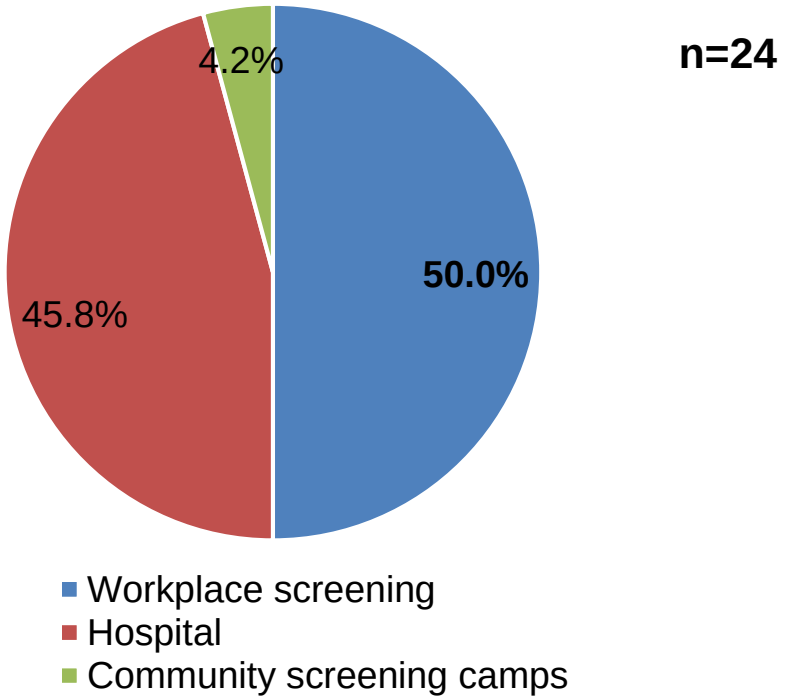


Figure 4.21 place of hypertension diagnosis among employees above 35 years of age

4.6.IV.3Life style changes after hypertension diagnosed

69% of those who were previously diagnosed with hypertension reported that they made some lifestyle changes after its detection. The remaining 31% stated that they did not make any such changes. (Figure 4.22)

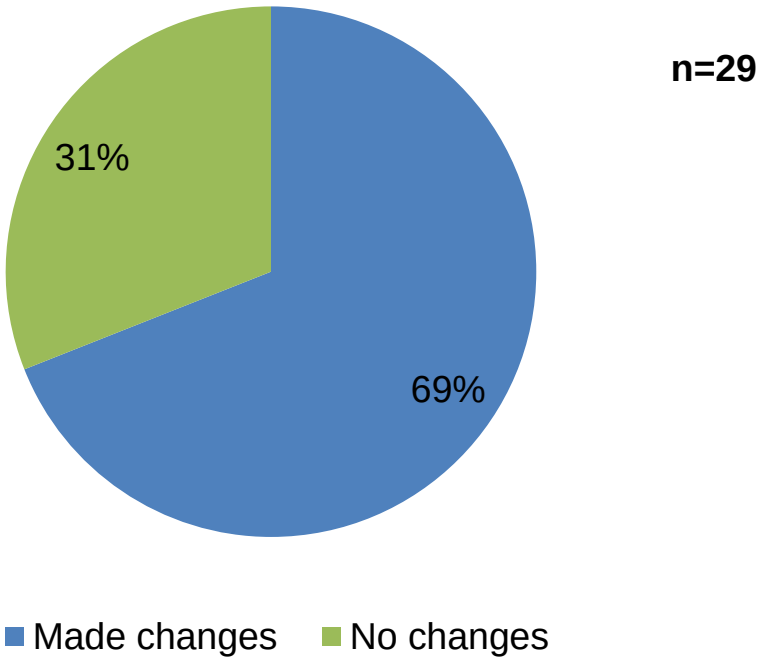


Figure 4.22 Life style changes after diagnosed with hypertension

Table 4.6 Hypertension History, Medication, and Monitoring Practices among Respondents

HYPERTENSION HISTORY/TREATMENT	FREQUENCY	%
FAMILY HISTORY OF HYPERTENSION (n=317)	98	30.9
UNDER MEDICATION FOR HYPERTENSION (n=29)	18	62.1
PERIODICALLY MONITORS HYPERTENSION (n=29)	18	62.1

4.6.IV.6 Family history of hypertension

Among the 317 respondents around 31% of them mentioned that one or more of their family members had been diagnosed with hypertension. This is shown in the (Table 4.6).

4.6.IV.7 Under medication for hypertension

About 62% of those who were already diagnosed with hypertension stated that they were under medication. While the remaining 37.9% did not take any medication for their condition. (Table 4.6)

4.6.IV.8 Undergoing periodic monitoring for Hypertension

Among the 29 participants with hypertension 62.1% reported that they undergo periodic monitoring for hypertension. The remaining 37.9% stated that they do not periodically monitor their condition.

4.6.IV.9 Place of treatment among hypertensive patients

The figure below illustrates the place of regular treatment for those with hypertension. Most hypertensive patients (41.4%) visited a government facility for treatment, and around 38% visited a private health facility, while 20.7% took their regular treatment at the workplace.

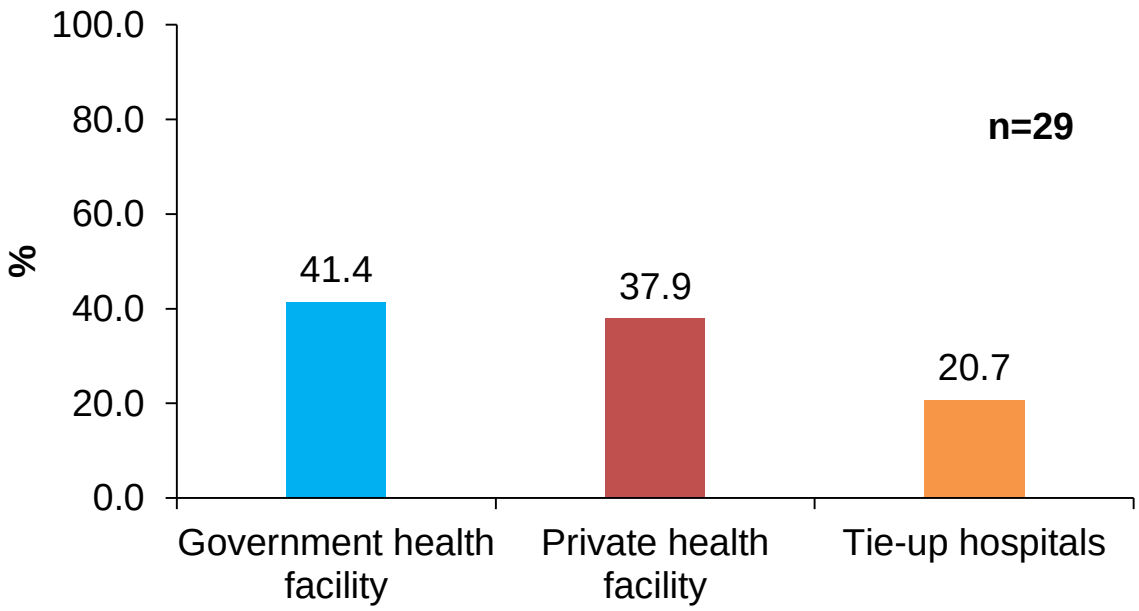


Figure 4.23 Place of treatment among hypertensive patients

4.6.V Place of Detection among those with both diabetes and hypertension

Among the 8 participants who reported that they had been previously diagnosed with diabetes and hypertension, 2 (25%) participants mentioned that they were first diagnosed for both diabetes and hypertension at the workplace.

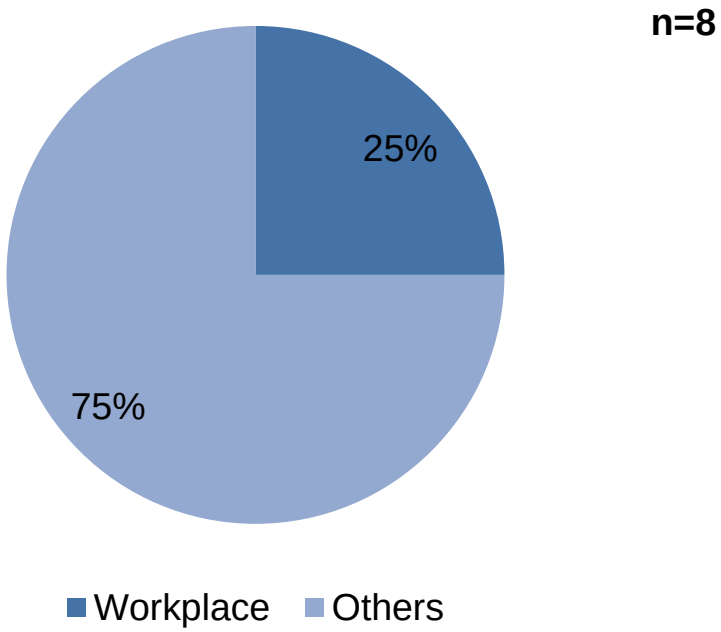


Figure 4.24 place of detection among those with both diabetes and hypertension workplace

4.7 Employees' perception on workplace screening

The employees' perception on workplace screening program convenience, impact and effectiveness is provided in the table below.

Table 4.7 Employees' perception on workplace screening

Characteristics	Frequency	%
Convenience of scheduling (n=295)		
More convenient	134	45.4
Normal	147	49.8
More difficult	14	4.7
Convenience of location (n=295)		
More convenient	135	45.8
Normal	147	49.8
More difficult	13	4.4
Convenience of waiting time (n=295)		
More convenient	131	44.4
Normal	154	52.2
More difficult	10	3.4
Interested to participate in future NCD screening (n=317)	**258**	**81.4**
Concerns in currently conducted NCD screening (n=317)	55	17.4
Believe NCD screening has positively impacted overall health (n=317)	191	64.7
Recommends worksite NCD screening program to colleagues (n=317)	241	76
Workplace NCD screening encourage action towards health (n=295)	225	76.3
NCD screening program help to raise awareness among friends and family (n=317)	265	83.6
Organization support on overall health of the employees (n=317)		
Very much	151	47.6
Average	152	47.9
Not at all	14	4.4

4.7.1 Convenience Factors

The perception of the employees on workplace screening in terms of scheduling, location and waiting time convenience was obtained from those who had previously participated in any workplace screening program.

4.7.2 Convenience in scheduling

Almost half (49.8%) of the respondents said that the scheduling was normal, while 45.4% said it was more convenient, and about 4.7% found it more difficult.

4.7.3 Convenience of location

In terms of convenience of the location, a similar trend was seen, with 49.8% rating it as normal, 45.8% finding it more convenient, and 4.4% considering it more difficult.

4.7.4 Convenience of waiting time

Most respondents (52.2%) reported a normal waiting time, 44.4% found it more convenient, and only 3.4% found it difficult.

4.7.5 Interest to participate in future NCD screening programs

Among the 317 respondents, Majority (81.4%) of the respondents were willing to participate in future NCD screening programs. However, 18.6% of the respondents were not willing to participate.

4.7.6 Concerns in currently conducted NCD screening

17.4% of the respondents mentioned that they had some concerns with the currently conducted screening program, while most of the respondents (82.6%) mentioned that they did not have any concerns with the screening program.

4.7.7 Believe NCD screening has positively impacted overall health

Those who had previously participated in workplace NCD screening were asked about the impact of screening on overall health. 64.7% of the respondents believe that the NCD screening has created a positive impact on their overall health. While remaining 35.3% do not think so.

4.7.8 Recommends worksite NCD screening program to colleagues

Of the 317 respondents, most (76%) of them said that they would recommend workplace NCD screening program to their colleagues, while the remaining 24% said that they would not recommend.

4.7.9 Workplace NCD screening encourage action towards health

Among the 295 respondents who had participated in workplace screening, 76.3% reported that the workplace screening program encourages them to take an action towards their health. However, the rest do not think so.

4.7.10 NCD screening program help to raise awareness among friends and family

Around 84% of the 317 respondents think that the NCD screening program has raised awareness on the importance of NCD screening among friends and family.

4.8 Satisfaction with Workplace screening program

The satisfaction with the workplace screening program was assessed among the respondents who had previously participated (n=295) in such programs. An overall score to determine the level of satisfaction was calculated. This was based on a set of direct and indirect variables related to screening program. A weighted score was assigned for each of the variables. The final classification into satisfied and dissatisfied was based on the median score.

4.8.1 Overall satisfaction of workplace screening

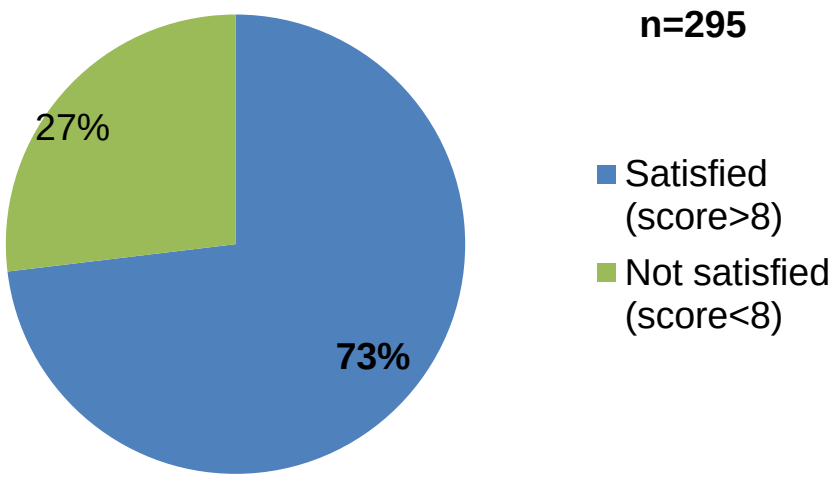


Figure 4.25Overall satisfaction of workplace screening

The pie chart illustrates overall satisfaction with workplace screening among 295 participants of workplace screening. The findings indicate that 73% (n=215) of participants reported being satisfied with the screening process, scoring above 8 on the satisfaction scale, while 27% (n=80) of participants were not satisfied, scoring below 8 on the satisfaction scale.

4.8.2 Satisfaction among those below 35 years of age

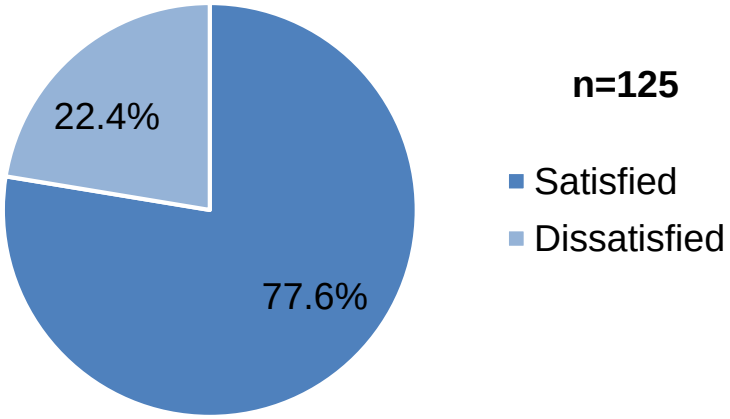


Figure 4.26Satisfaction among those below 35 years of age

The pie chart presents the satisfaction levels with the workplace screening program among employees under 35 years of age (n=125). 78% of participants reported being satisfied with the screening program. 22% of participants expressed dissatisfaction.

4.8.3 Satisfaction among those above or equal to 35 years of age

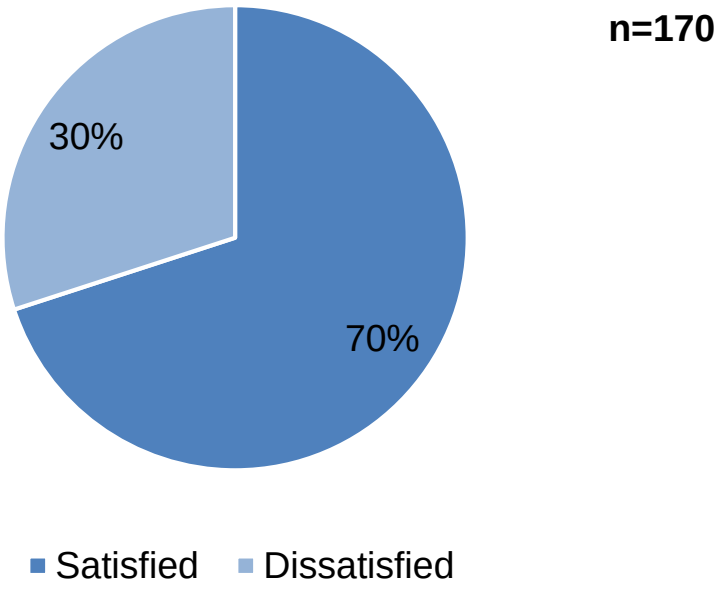


Figure 4.27Satisfaction among those above or equal to 35 years of age

The pie chart illustrates the satisfaction levels with the workplace screening program among employees aged 35 years and above (n=170). 70% of participants reported being satisfied with the screening program. 30% of participants expressed dissatisfaction.

4.8.4 Level of satisfaction among those diagnosed with diabetes or hypertension in workplace screening

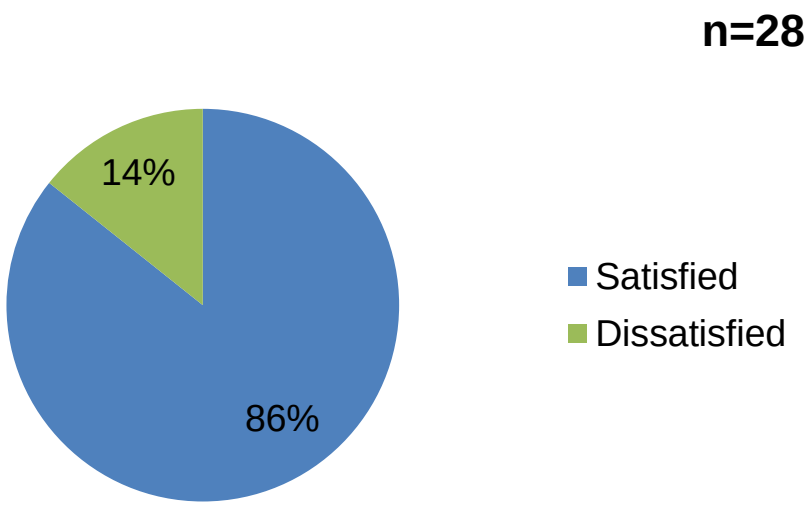


Figure 4.28Level of satisfaction among those diagnosed with diabetes or hypertension in workplace screening

The pie chart presents the satisfaction levels of employees who were diagnosed with diabetes (DM) or hypertension (HTN) through workplace screening (n=28). 86% of participants were satisfied with the screening process. 14% of participants were dissatisfied.

4.9industriesranking based on workplace health infrastructure

Each industry was evaluated based on various infrastructure-related factors, with scores assigned to specific variables. These included the availability of an Occupational Health Center (OHC), the presence of a Medical Officer (MO) and a Staff Nurse (SN), and whether the OHC was functional. Additional factors considered were the availability of healthy food options, gym facilities, yoga classes, walking tracks, the provision of mandatory health screenings, the frequency of screenings, education on screening, and the level of organizational support for health initiatives. The total score was then computed to reflect the overall infrastructure score, indicating the extent of health and wellness infrastructure within the industry. Based on this score, industries were

categorized into three levels: Basic (0–5), Moderate (6–10), and Advanced (11–15), representing the degree to which workplace health infrastructure was developed and integrated into organizational settings.This ranking helps assess the level of workplace health infrastructure across industries, guiding organizations in improving employee well-being. It also enables comparisons between industries, encouraging investments in better health facilities and wellness initiatives.

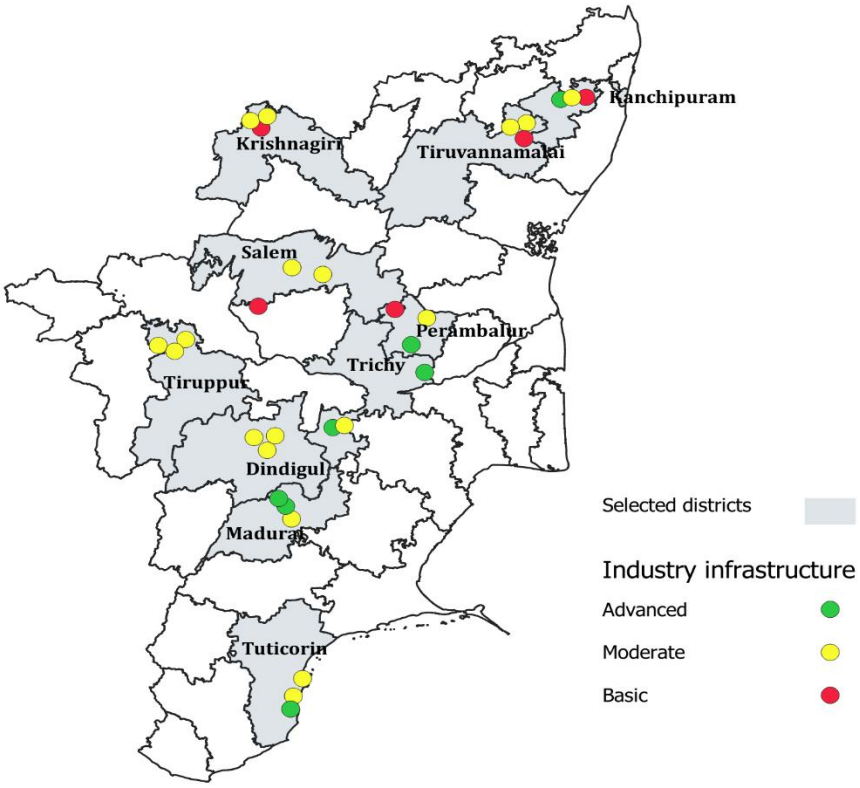


Figure 4.29 Industry Ranking

The following are industries list ranked under advanced, Moderate and Basic categories

ADVANCED	
District	**Name of the industry**
Madurai	GHCL mills
	Manna Foods P ltd
Perambalur	MRF Tyres
Thoothukudi	DCW Limited,
Tiruvannamalai	Schwing Stetter India Pvt Ltd
Trichy	Colour Jersey
	Dalmia Cements (Bharath) Ltd

MODERATE	
District	**Name of the industry**
Dindigul	Shanmugavel mills, private Ltd, Unit II
	Sivaraj spinning mills Pvt Ltd.
	Vedha spinning mills Private Ltd. Unit-1
Kancheepuram	Kone elevator
	Nippon Paint IndiaPvt Ltd
Krishnagiri	Carborundum universal industry
	First step baby wear
Madurai	Fenner India limited
Perambalur	Perambalur Sugar mills
Salem	Hatsun
	Indian oil
Thoothukudi	Ashwini Fisheries Ltd.,
	Madura Coats Pvt Limited,
Tiruppur	KPR Garments and apparels limited

	KPR Mill Limited
	Sakthi Auto Components
Tiruvannamalai	Lotus Footwear Enterprises Ltd.
Trichy	GHC Limited

BASIC	
District	**Name of the industry**
Kancheepuram	Kus Auto India
Krishnagiri	Bimetal
Perambalur	DhanalakshmiSreenivasan Sugars (P) Ltd
Salem	Indian petroleum
Tiruvannamalai	Rockman industries

CHAPTER 5

Adaptability and Sustainability

Non-Communicable Diseases (NCDs) such as diabetes, hypertension, cardiovascular diseases, and cancer significantly impact workforce productivity and economic stability.Most of the working population in the factories are between 18 and 50 years ofage, who are frequently missed during Home based NCD screening (MTM) duringworking hours.Recognizing this, the Tamil Nadu Health System Reform Program has initiated and implemented Workplace NCD Screening Programs in organized sectors to facilitate early detection and intervention.Thus, the work-place based medical camps conducted in these factories will helpin screening these bread-winners of the families for NCDs.These screenings aim to enhance employee well-being, reduce absenteeism, and integrate preventive healthcare into corporate settings. However, the success of such programs is influenced by various disablers (challenges) and enablers (facilitating factors) that determine their adaptability and scalability.

This Chapter examines the disablers and enablers of the Workplace NCD Screening Program within the Tamil Nadu Health System, focusing on adaptability (how easily the program can be initiated and sustained) and scalability (how effectively it can be expanded across industries and workforce segments).

Adaptability of Workplace NCD Screening in Tamil Nadu

Health System

The adaptability of the Workplace NCD Screening Program depends on the health system’s operational capacity, collaboration with industries, and its ability to engage employees in sustainable screenings. Operational factors such as workforce availability, medical resources, and screening protocols play a critical role in the smooth implementation of the program. The effectiveness of the program is often limited by workforce shortages and inadequate training for healthcare professionals in workplace-specific screening protocols. Additionally, weak intra-system coordination among Primary Health Centers (PHCs), Employees' State Insurance (ESI) hospitals, and

industries leads to inefficiencies in diagnosis, treatment, and referral systems. Strengthening partnerships between Tamil Nadu's PHCs, ESI hospitals, and industries is crucial to ensuring proper follow-ups and sustained care for employees diagnosed with NCDs. Employee engagement is a vital enabler within the health system, as many employees hesitate to participate in screenings due to limited awareness, misconceptions, or stigma. Effective awareness campaigns, pre-screening education, and employer-led incentives can improve participation rates. Proper intra-system collaboration, including training programs for health workers and structured referral mechanisms, ensures that diagnosed employees receive timely and appropriate care, preventing the screenings from becoming one-time interventions.

Industries

Small-Scale Industries

The ability of small-scale industries to adapt the screening program is often hindered by financial limitations, lack of dedicated health infrastructure, and workforce constraints. Many small enterprises operate on tight budgets and cannot allocate resources for regular health check-ups. Awareness levels among employees are also lower in these sectors, reducing participation in screening programs. Additionally, process inefficiencies such as poor intra-industry coordination and inadequate communication between industry stakeholders and health authorities hinder effective implementation. Establishing structured collaboration between industries, health departments, and industry associations can help address these challenges. Incentivizing participation through financial support, mobile screening units, and industry-wide planning efforts can improve adaption and ensure sustained engagement.

Medium-Scale Industries

Medium-scale industries face challenges in integrating screening programs within their operational frameworks. Shift-based work schedules and production demands make it difficult to mobilize employees for screenings. Furthermore, limited HR capacity and administrative delays slow down adaption. Lack of intra-coordination within companies,

where different departments operate in silos, further reduces efficiency. Effective collaboration with health departments, well-planned scheduling that aligns with production cycles, and leadership support from management can enhance participation and ensure long-term integration of screenings into workplace policies. Raising awareness among employees and integrating health programs into corporate wellness initiatives will further encourage workforce engagement.

Large-Scale Industries

Large-scale industries have the advantage of corporate wellness policies and dedicated health infrastructure. However, administrative processes and logistical challenges associated with implementing screenings across multiple locations often hinder timely execution. A proactive approach involving leadership support, HR-led awareness campaigns, and integration with existing employee wellness initiatives can facilitate seamless implementation. Employee engagement is particularly crucial in large industries, where misconceptions, workplace stigma, and lack of time often deter participation. Providing incentives such as paid health leave, onsite medical facilities, and follow-up support enhances participation rates. Strong intra-coordination within large organizations, with clear roles assigned to HR, medical teams, and department heads, ensures the seamless execution of the screening program without disrupting productivity.

Scalability of Workplace NCD Screening in Tamil Nadu

Health System

Scalability determines how effectively the Workplace NCD Screening Program can be expanded across different industries, locations, and workforce segments while maintaining quality and efficiency. One of the primary enablers for scalability is collaboration within the health system. Strengthening referral networks between workplace screenings, PHCs, and ESI hospitals ensures continuous care and treatment for employees diagnosed with NCDs. The integration of digital health solutions such as electronic health records (EHRs) and mobile health applications facilitates seamless

health data tracking and improves continuity of care. Additionally, increasing healthcare workforce capacity through training programs enables the health system to manage higher screening volumes efficiently. Effective inter-coordination between health departments, industries, and policymakers is crucial to standardizing screening protocols and ensuring equitable access across different workforce segments. To sustain employee engagement at large scale, awareness initiatives should be expanded using digital platforms, workplace wellness programs, and sustained employer support.

Industries

Small-Scale Industries

The scalability of NCD screening programs in small-scale industries is hindered by financial constraints, high employee turnover, and reliance on external healthcare support. Expanding the reach of screenings requires industry-wide collaboration, government support, and mobile health units that can provide on-site screenings. Public-private partnerships and CSR funding can help bridge financial gaps, making the program more accessible to small-scaleindustries. Increasing awareness through industry-wide campaigns and training HR personnel to facilitate screenings can improve adaption and long-term scalability. Standardized referral pathways between industries and PHCs can ensure that employees receive the necessary follow-up care.

Medium-Scale Industries

Medium-scale industries require strategic planning to scale up screening programs. Cost-effective models, such as group screenings and telemedicine consultations, can be implemented to ensure feasibility. Standardized screening protocols across multiple branches help maintain consistency and improve health outcomes. Collaboration with industry associations and healthcare providers is essential to ensuring long-term scalability. Strengthening inter-coordination among industries and regulatory bodies facilitates uniform policy implementation, allowing medium-scale industries to integrate screenings into regular corporate wellness programs without operational disruptions.

Large-Scale Industries

Large-scale industries have the potential to expand screenings rapidly, but logistical complexities and the need for sustained engagement pose challenges. Implementing centralized health monitoring systems and integrating screenings into routine employee health check-ups can ensure scalability. Strong corporate health policies and leadership-driven initiatives enhance program sustainability across multiple locations. Inter-industry coordination is critical for scaling up programs across industry clusters, ensuring that health screenings become a standardized best practice rather than isolated interventions. Additionally, expanding awareness efforts through employee wellness apps, internal communication channels, and periodic health campaigns will sustain participation and long-term impact.

The Workplace NCD Screening Program in Tamil Nadu has the potential to significantly improve workforce health and productivity. However, its success depends on addressing adaptability and scalability challenges through strong healthcare system coordination, industry collaboration, and employee engagement strategies. By leveraging key enablers such as structured planning, financial support, technology integration, and leadership involvement, the Tamil Nadu Health System can transform workplace screenings into a sustainable preventive healthcare initiative across small, medium, and large-scale industries. Establishing a culture of preventive healthcare within industries will not only enhance employee well-being but also contribute to the long-term economic and social development of Tamil Nadu.

CHAPTER 6

Discussion

Workplace NCD screenings are a crucial tool for early disease detection and improving employee well-being. However, their effectiveness is often undermined by operational, logistical, and behavioral challenges. Addressing these barriers while leveraging key enablers can create a sustainable and impactful screening framework that balances health priorities with workplace productivity.

A major limitation of workplace screenings is the lack of continuity, as they are often one-time interventions without proper follow-up mechanisms. This results in undiagnosed or poorly managed chronic conditions, further exacerbated by workforce shortages and overburdened healthcare services. Additionally, many industries and healthcare workers lack familiarity with screening protocols, leading to inconsistent implementation.

Insufficient communication from key stakeholders, such as DISH, results in industries deprioritizing screenings due to perceived productivity disruptions. The reliance on overstretched mobile medical units (MMUs), inadequate medical supplies, and the absence of dedicated transportation further hinder timely screenings. Investing in sufficient healthcare personnel, transportation solutions, and medical resources is essential for streamlining screening efforts.

Temporary and migrant workers face significant challenges in accessing post-screening care due to work pressures, financial constraints, and frequent relocations. Without employer-supported healthcare programs and referral networks, follow-up rates remain low. Additionally, workplace concerns such as irregular work schedules, fear of job loss, and stigma around health conditions deter participation. Industries lacking dedicated screening spaces further diminish worker engagement. Implementing awareness campaigns, industry engagement initiatives, and dedicated health spaces can enhance participation and credibility.

Logistical barriers, including production demands and shift-based work schedules, make mobilizing employees for screenings difficult. Lengthy approval processes, especially in multinational corporations, create delays in scheduling screenings. Engaging leadership and integrating pre-scheduled screenings into workplace health policies can mitigate these challenges. Behavioral factors also impact participation, as younger employees often underestimate the importance of screenings, while older workers may resist participation due to misconceptions and stigma. In rural areas, transportation barriers and low health awareness further complicate screening efforts. Targeted awareness initiatives and strategic planning are necessary to enhance screening accessibility and participation.

Key Enablers for Effective Screenings

A structured and well-coordinated approach is critical to overcoming these barriers. One of the most significant enablers is establishing a robust referral system that connects workplace screenings with healthcare facilities such as PHCs and ESI hospitals. This ensures employees receive necessary follow-up care, preventing treatment gaps and promoting sustained well-being.

Optimizing screening schedules based on workforce size and shift patterns enhances accessibility and participation. Industries that tailor their screening schedules to accommodate shift workers—such as those arriving early or staying after shifts—experience higher engagement levels. Occupational Health Centres (OHCs) can further strengthen screenings by providing in-house medical support, improving efficiency and outreach.

Collaboration among industries, healthcare providers, and corporate social responsibility (CSR) initiatives is vital in ensuring program sustainability. Strong partnerships between PHCs and ESI hospitals enable seamless screening, diagnosis, and treatment processes. CSR funding can help bridge infrastructural gaps, enhancing screening facilities and health awareness programs. Such collaborative efforts build trust and improve employee engagement.

Management support is another crucial enabler. When leadership actively promotes and facilitates health screenings, participation increases, execution becomes more efficient, and employees feel encouraged to prioritize their health. Effective intra- and inter-organizational coordination among HR teams, industry representatives, and healthcare providers ensures seamless screening implementation without disrupting productivity.

Raising awareness before screenings significantly improves participation rates. Employees may be unaware of the benefits of health check-ups or hesitate due to misinformation. Pre-screening communication through HR teams, awareness campaigns, and direct engagement helps address these concerns. Training for doctors, nurses, and screening staff is also essential to effectively communicate the importance of preventive healthcare and encourage participation.

Ultimately, employee engagement remains the driving force behind the success of workplace health programs. Many employees already demonstrate proactive interest in their health by willingly attending screenings and seeking alternative testing options when workplace screenings are unavailable. Encouraging this behavior through continuous health education and workplace wellness programs further strengthens participation and improves long-term health outcomes.

Early detection

The workplace screening program has played an important role in the early detection of the non-communicable diseases, specifically diabetes and hypertension.This is evident with the percentage of new cases identified at the workplace. Among those diagnosed with diabetes 44.1% were first detected at the workplace screening, and among those diagnosed with hypertension, more than half of the proportion were diagnosed at the workplace (51.7%). Notably, both the study participants under the age of 35 who had diabetes were first diagnosed at the workplace.Among the 5 participants with hypertension under the age 35, 60% were first detected at the workplace screening.

Lifestyle changes

23.8% of the 295 respondents who had previously taken part in workplace screening said they had changed their lifestyle as a result of the program. 93.3% of the 15 people who were given a diabetes diagnosis as a result of workplace screening reported changing their lifestyle. Similarly 60% of the 15 participants who were given a hypertension diagnosis after workplace screening said they had changed their lifestyle. These results highlight how workplace screening initiatives raise awareness and thereby promote behavioral changes.

Program perception

The high rate (81.4%) of respondents' willingness to undergo future non-communicable disease (NCD) screening programs is indicative of high acceptance of workplace health programs. This indicates that workers value such programs and are willing to engage in preventive health practices in the future. In addition, 64.7% of the respondents indicated that workplace NCD screening positively influenced their general health. This points to the efficacy of such programs in raising health awareness and promoting proactive health care among workers. Of those who were diagnosed with either diabetes or hypertension in the workplace, 86% were satisfied with the screening experience. This suggests that the program not only effectively identifies undiagnosed conditions but also provides a positive experience for participants, which may serve to encourage further participation in future screenings.

One of the most striking results is that employees in industries that are supportive of their health and well being were 19.14 times more likely to engage in workplace screening programs than those in less supportive workplaces. This highlights the importance of employer support in facilitating workplace health programs. Industries that value employee well-being by promoting a health-oriented culture, offering incentives, and making screenings accessible can make a big difference in participation rates.

Overall, these results indicate that workplace screening programs are embraced, have a positive effect on employees' health, and can be further enhanced by employer involvement and support.

CHAPTER 7

Recommendations

Scalability- Health system: To Scale up current workplace screening program for Non-Communicable disease (NCD) program across the state, the following points are essential

- Step by step Guidelines: Develop clear and detailed guidelines outlining the entire implementation process to ensure consistency and efficiency across different locations.
- Human Resource and Infrastructure: Ensure the availability of human resources in place, trained resources, necessary infrastructure and consumables. This is essential for maintaining the quality of screening services
- State wide screening: State wide screening of diabetes mellitus (DM) and Hypertension (HT) is feasible provided guidelines are in place and human resource are accessible and available.
- Phased scalability of other NCDs: The screening program can be expanded to include other NCDs in phased manner, allowing for gradual implementation and ensuring that the necessary resources and infrastructure are in palce for each stage.
- Mobile medical unit (MMUs): For industries with non-functional or Unavailable occupational health centers (OHC's), MMUs can be used to deliver screening services, to ensure all industries have access to health services.
- Interdepartmental Colloaboration: Strengthening collaboration between key department (Such as the ESI, DISH and DPHPM) will enhance the coordination and delivery of NCD screening services across sectors.

Adaptability:

- The program can be adaptable and tailored to different regions and industries by leveraging existing resources and strategies.

- Utilizing Data from large industries: NCD screening data from large industries with functional OHCs that comply with statutory health requirements can be utilized, by this way human resource can be optimized to reach the maximum.
- Replicating successful strategies: Successful strategies and approaches from some district can be learned and replicate in other districts, ensuring that effective methods are shared and scaled across different regions. This allows for local adaptations based on specific district and industrial needs.

CHAPTER 8

Conclusion

Workplace NCD screenings, while essential for early disease detection, need to be integrated into a larger, continuous healthcare strategy rather than functioning as isolated interventions. A holistic approach is required to ensure that screenings translate into meaningful health improvements. Strengthening referral systems is vital, as seamless connections between workplace screenings and healthcare providers ensure timely follow-up care and sustained treatment for chronic conditions.

Structured follow-up mechanisms must be implemented to track suspected cases through screening and diagnosed employees, provide necessary medical support, and encourage adherence to treatment plans. This requires industries to work closely with healthcare professionals to establish clear protocols for post-screening care, including accessible treatment pathways and financial support for those in need.

Collaboration with industries and health care providers must be reinforced to enhance the sustainability and impact of the work place screening programs. Effective planning and strong management support are critical for integrating health screenings into workplace. By making preventive healthcare a core aspect of corporate wellness initiatives, industries can improve long-term health outcomes while maintaining workforce productivity. Employees must also be empowered through continuous awareness campaigns and health education, ensuring they recognize the value of screenings and take proactive steps toward their well-being.

Ultimately, a well-structured, collaborative, and employee-centric approach is the key to transforming workplace health screenings from periodic interventions into a long-term, impactful health strategy. By addressing both operational barriers and behavioral challenges, industries can create an environment where preventive healthcare is accessible, effective, and beneficial for all stakeholders.

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Annexures

ANNEXURE I

Disablers and Enablers USING CFIR			
CFIR DOMAIN	CFIR CONSTRUCT	Disabler or Enabler	Explanation of facilitators and barriers
I. OUTER SETTING	**Local Conditions**	Disabler	Fractured Continuity of screening. Facilitation by DISH for organizing advocacy meetings with key officials. Lack of Human resources (Available team, including lab technician) Delay in supply of consumables. Lack of Vehicle for screening Team
		Enabler	Number of screening days based on employees count
	Partnerships & Connections	Enabler	Networking with ESI team is good enabled for follow-up activities Recommendations of appropriate referral centers and doctors by screening team Collaboration between CSR of Industries and the health System
	Policies & Laws	Disabler	Post screening follow-up of workers health and treatment especially for short term / contractual workers is limited. Referrals provided for Individuals based on the current residence Unawareness of guidelines and protocols
	External Pressure		
	i. Performance-Measurement Pressure	Disabler	Additional responsibility and monitored for achieving the targets

	Structural Characteristics		
II. INNER SETTING DOMAIN	i. Physical Infrastructure	Disabler	Unavailable of Adequate space for screening (where no OHC is Not available/ functional)
		Enabler	Presence of OHC
	ii. Work Infrastructure	Disabler	Lack of resources for replace, so that it will not affect theproduction
	Relational Connections	Enabler	Organising camps/ health checkups in a preplanned and well-structured manner by the industry. Assistance from the OHC team for conducting screenings.
	Communications	Disabler	Communication gap- Unaware about the screening. Helping the public, understand their health issues and ensuring they receive treatment
	Culture		
	Recipient-Centeredness	Disabler	Lack of Positive attitude towards the overall treatment process
		Enabler	Management that supports employee wellness and health
III. INDIVIDUALS DOMAIN	**Need**	Disabler	Limited awareness about the screening, Stigma, and Self-interest of the participants
		Enabler	Personal interest from the employees
	Capability	Enabler	Support from the employees
	Opportunity	Disabler	Well-structured health facilities available within the industry
	Motivation	Disabler	Lack of motivation
IV. IMPLEMENTATION PROCESS DOMAIN	**Teaming**	Disabler	Delayed permission Approaching large scale industries Travelling to industrial sites
		Enabler	Collaboration between PHC, ESI and Industries Co-operation of entire medical team

	Planning	Enabler	Strong collaboration between management and employees.
		Disabler	Mobilization of workers, Proper planning to accommodate night shift employees and early shifts, unmatched shift time for providers and employees ,Limited time allocated for screening activities Time required for planning and organizing screening/health camps, Communication gaps among colleagues, unawareness about the program, team involved or purpose of the program
	Engaging	Disabler	Convincing the management, Cooperation f the industry, Delayed participation of employees
	1. Innovation Deliverers	Enabler	Maintaining good rapport with stakeholders
	2. Innovation Recipients	Enabler	Relationship and coordinating with industries to plan in advance
	Doing	Facilitator	Raising awareness prior to the screening

ANNEXURE II

District wise Disablers and Enablers

District	Disablers	Enablers
Trichy	1. There are 14 factories with occupational health centers, out of which four are under the central government. These factories are not cooperating with the state government, denying access for screening and data collection. 2. A private factory with headquarters in Saudi Arabia required permission from their HQ. Despite emails and discussions with HR, they refused to allow screening. 3. Some workers are opting for private facilities due to mismatched vaccine doses. They question the efficiency of government-provided drugs and refuse screening. 4. Official orders are given, but coordination from DISH is lacking. DPH and DISH coordination is weak, and action is taken only after repeated insistence. 5. Private factories pose challenges in getting approval for screening. Some, like a factory in	1. Conducting regular meetings between DISH and DPH would improve coordination and make the process smoother. 2. The screening program involves a hierarchy of health workers: Block Health Supervisors, Health Inspectors, MTM Health Inspectors, Multi-Purpose Health Workers (MLHPs), and Women Health Volunteers (WHVs). WHVs play a key role in conducting NCD screenings using glucometers and BP monitors. 3. Establishing an occupational health hub for industries, similar to Mobile Medical Units, would help manage workers' health efficiently. With large worker populations in industries a dedicated hub would reduce workload while ensuring comprehensive health coverage.

	Perungalathur, require permission from their Dubai HQ and remain unresponsive. 6. Many workers are temporary and fear that screening might lead to job insecurity. They resisted initially but were later convinced. 7. Large-scale industries require a procedural approach, needing approvals from higher management. Only after official permissions and scheduled dates can screening be done. 8. Small-scale industries are more cooperative, allowing screening at any time without procedural delays.	
Perambalur	1. Challenges include reagent availability and funding issues for testing in MMU labs. Proper funding would ensure smoother testing, as MMU teams frequently visit and check the process. 2. In one industry, the first plant had a good rapport with the BMO and GM, ensuring smooth screening. The second plant faced access issues due to safety restrictions,	1. Contract employees often change companies, and linking Aadhaar could help track them. However, currently, only mobile numbers are used, and Aadhaar is not collected in MTM. The new ABHA ID is Aadhaar-linked but not yet mandatory. 2. OHC doctors should ensure proper follow-ups and provide necessary medicines to

	but coordination improved after direct discussions with the GM. Screening was scheduled in shifts to cover all employees. 3. Production demands create challenges, as mandatory screening disrupts work schedules. Employees hesitate to participate, fearing it might affect their sick leave. 4. Scheduling conflicts arise as MLHPs struggle with shift timings, and WHVs can only work when free. Lack of additional support slows the process. Equipment issues, such as digital BP monitors running out of battery and insufficient funding for rechargeable batteries, add to the difficulties. Coordination with other departments is also lacking.	employees for better healthcare management. 3. Involving WHVs along with the MMU team would be beneficial. Increasing the workforce would help improve efficiency and coverage of screening programs.
Dindigul	1. To ensure all shift workers are covered, screening is conducted after work hours. 2. Manpower has decreased, making it challenging to manage the workload. The existing team is handling workplace NCD	1. PHC and ESI are coordinating; PHC handles diagnosis, while ESI manages follow-ups. 2. There are 16 industries, with screening camps organized based on workforce size: one camp for 500

	screening without additional support, increasing their burden.	employees and two camps for 700 employees. 3. Follow-ups should be conducted every two months and should be based on HUD rather than block-level planning.
Madurai	1. Public health awareness is low, making it difficult to convince employees about screening benefits. 2. Sometimes, work scheduled for one day extends to two due to industry constraints, but the effort is still worthwhile. 3. Prior permission is needed as industries have daily production targets, and they don't want work to be affected. Balancing health screening with production is a challenge. 4. Screening takes time, including BP, RBS checks, and follow-ups. Workers don't understand the process and often don't cooperate. 5. Communication gaps exist—coordinators inform only a few, leading to poor participation, and many workers claim they weren't informed.	1. Industries prioritize production, so we plan carefully to ensure screening doesn't disrupt their workflow. 2. Industries are tied up with CSR initiatives, supporting health facilities by providing resources like fogging machines and PHC renovations. 3. Due to this good rapport, accessing industries for health programs has been relatively easier.

	6. Medical teams are sometimes given improper locations, such as near toilets, and are not treated with respect. 7. Some industries don't respond properly, making excuses about shifts or failing to send workers despite prior notice. 8. A government industry had the worst response—out of 300+ employees, only 11 participated on the first day, and even fewer on the next. 9. Employees focus only on monetary benefits (work) and lack self-awareness about health. 10. Proper coordination and communication are necessary for better participation and awareness.	
Thoothukudi	1. A major challenge is that workers often do not believe their test results. They doubt diagnoses of high sugar, high BP, or heart changes even after ECG screenings, making follow-ups difficult. 2. Many workers do not take regular medication. Some start treatment but skip doses, while others stop altogether, making consistent follow-up a	1. Permission is obtained from the industry first, and a date is fixed for screening. 2. Every Saturday, instead of visiting the community, WHV will conduct screenings inside the industry. 3. Employees are sent for screening in small batches to ensure work is not affected while health check-ups are

	major challenge.	conducted smoothly.
Krishnagiri	1. Getting permission from industries is very challenging, as there is no immediate response. Only after repeated discussions do they agree. 2. Even after securing permission and setting up the camp, employee participation is uncertain. Many do not attend, making the effort ineffective. 3. Industries prioritize production over employee health, showing minimal cooperation and disregarding screening initiatives.	1. Teamwork and industry cooperation are key to success. Once industries grant permission and plan, the process runs smoothly with employee support. 2. If the government passes a GO for industry participation, it will improve compliance. Otherwise, it remains challenging. Conducting awareness meetings with industry management can help make NCD screening more effective.
Tiruvannamalai	The issue is not with employees but with the administration. They hesitate, fearing production loss. There is a delay in sending employees for screening.	If the OHC doctor cooperates well, the process can be completed smoothly. In Unit 2, the doctor was highly cooperative, and screening was completed quickly. Our team alone cannot finish the process; the OHC staff also need to provide support.
Tiruppur	1. The main barrier in the company is the insufficient manpower due to a large number of employees. A full-fledged screening is not possible,	NCD screening was successfully completed with proper teamwork. Effective coordination among the team members makes the process easier and more efficient.

	but with more manpower, it can be done effectively. 2. Permission is often delayed as industries ensure that production is not affected, which causes a lag in the process. 3. While equipment is available, industries require more resources. Additional support would improve efficiency.	
Salem	1. One of the main challenges is assembling employees for screening. Due to production demands, it is difficult to ensure everyone's participation. 2. Awareness about NCD screening is low among people, so providing proper IEC (Information, Education, and Communication) is crucial. However, even after a week of awareness, follow-up becomes difficult. 3. Educating people about diabetes, BP, and cancer is essential, as awareness plays a key role in disease prevention and control.	1. The industry staff have been very supportive, providing all necessary facilities for the screening process. 2. Proper follow-up is crucial; without it, monitoring most patients effectively becomes challenging.
Kanchipuram	1. ESI started screening with our manpower and	1. **Suggested Solution** – Implement a structured

	equipment support but later stopped due to shortages, leaving us solely responsible. This shift heavily impacted field operations, making work slow and inefficient. 2. Limited teams are overstretched, and MTM was handling field monitoring, but now both tasks fall entirely on us. Additionally, with only one Labour Unit Team per district, covering all locations is impossible. 3. Some companies provide support, while others can't due to production constraints. Immediate screening permissions are often denied due to audits or conflicting work schedules, leading to further delays. 4. Even when workers are gathered, only free part-time workers are sent, and they are often told to get screened after their work, sometimes while traveling by bus. This, along with limited manpower, disrupts both screening and fieldwork. 5. With 50–100 employees screened per day, completing one company takes too long, while industries can only pause	**one-day tour program,** where both companies and workers are informed in advance. Morning shift workers can be screened after duty, while evening shift workers can be screened in the morning before their shift, ensuring smooth operations. **2.** The screening process was initially delayed due to companies not granting permissions. However, with our team's dedication, some companies have started providing support. **3.** Also, Equipments are better now

	work for a short time. Out of 62 industries, over 50% have been screened, but no industry is fully completed yet. Positive cases are being detected, and PHC teams are managing follow-ups. 6. Tracking and following up is extremely difficult due to high workforce migration, making it challenging to ensure continuous monitoring and control. 7. The program started a year ago, but industries initially refused permission, citing work schedules and production impact, further delaying the process.	

ANNEXURE III

QUALITATIVE TOOL

Interview guide for **Employers** regarding barriers, facilitators, challenges, and motivators for implementing a workplace-based non-communicable disease (NCD) screening program

A. Name of the District:

B. Name of the Industry:

Introduction provided by the researcher to the key informant:

Briefly introduce yourself and the purpose of the interview.

Assure confidentiality of responses.

Socio Demographic profile	
1. Name	
2. Age	
3. Gender	
4. Employment status	A. Full time B. Part time C. Contract D. Others
5. Which department are you currently working?	
6. What is your Designation?	
7. What is your total Years of work Experience?	
8. What is your Years of Experience in the current industry?	
9. How many years do you have experience in the current sector?	

Background Information	
Can you provide an overview of your organization and its workforce demographics? Probe: Geographical distribution, gender distribution, age profile, educational profile, insurance profile,	
Have you implemented any health screening programs in the past? If yes, could you elaborate on them? Probe: disease-specific screening, wellness screening, diabetes and hypertension screening, infectious diseases, cancer screening?	
Understanding Perceptions	
What do you feel about importance of employee health within your organization? Probe: about sickness absenteeism, about work performance, about welfare of employees, employee rewards program	
How do you think a workplace-based NCD screening program benefited your employees and your organization? Probe: about sickness absenteeism, about work performance, about welfare of employees, planning to expand screening for other NCDs	
What are your concerns or reservations, if any, about implementing such a screening program? Probe: buy-in by employees, logistic arrangements, tie-up with medical providers	
Are your employees requesting screening camps, awareness programs on HT/DM or any other health?	

In terms of employee welfare, how is your organization/ industry/ company perceived by people outside Probe: Positives In your organization	
Do you believe your organization has provided all the features for employee welfare? Probe: HT/DM-related food/snacks, gym, other wellness activities/ referral services	
Barriers to Implementation	
What potential barriers or challenges do you foresee in implementing a workplace-based NCD screening program? (If they are already implementing, ask about what they have faced, and how can you improve it) Probe: infrastructural – space, privacy; personnel – doctors, nurses, allied health staff, persons to regulate crowd and flow of patients; planning; supplies – consumables, BP apparatus, stethoscope, lab tests, glucometer, medications; data management; acceptability by employees, as per SOP.	
Are there any financial, logistical, or cultural barriers that you anticipate? (or faced) Probe: acceptability, any financial implications, timings, balance between work timings and screening camp timings, cultural issues?	
How do you plan to address these barriers? (how have you addressed them) Probe: provide examples of good practices	

Facilitators for Implementation	
What factors or resources within your organization could facilitate the successful implementation of a screening program? (or what has successfully facilitated?) Probe: administrative buy in, leadership, facilities, infrastructure, funding, human resources, planning, data management	
Are there any existing wellness initiatives or support systems that could be leveraged? Probe: pre-existing medical centre, clinical services, safety office, medical and safety staff	
How do you plan to engage employees and encourage participation? Probe: How do you disseminate information, how do you motivate participation?	
Challenges and Solutions	
Based on your experience, what challenges have you encountered in implementing health-related programs in the workplace? How were these challenges addressed, and what lessons were learned?	
How do you plan to adapt or overcome similar challenges in implementing an NCD screening program?	
Employee Engagement and Motivation	
How do you plan to communicate the importance of NCD screening to your employees?	
What strategies do you think would be effective in	

motivating employees to participate in the screening program?	
Are there any incentives or rewards that you are considering to encourage participation?	

Interview guide for **Health care workers** regarding barriers, facilitators, challenges, and motivators for implementing a workplace-based non-communicable disease (NCD) screening program

Introduction given by the researcher to the Health Care Provider

- Briefly introduce yourself and your role in supporting the organization with the NCD screening program implementation.
- Explain the purpose of the interview: to understand the enablers and barriers from an external perspective to design an effective program.
- Assure them the confidentiality of all responses given by them.

Details	
1.Name of the district and block:	
2.Name:	
3.Age:	
4.Gender	
5.What is your Designation?	
Government Healthcare Experience	
Briefly describe your experience working within the government healthcare sector.	
Can you share any insights on successful workplace screening programs implemented? Probe for details on: • Target industry and disease focus • Key enablers for their success (e.g., leadership support, funding mechanisms) • Strategies for employee engagement and	

participation	
Understanding the Organization	
Based on your initial interactions, what are your impressions of the organization's culture and employee demographics?	
Are there any specific considerations for implementing a health program within an organization? (e.g., Regulations, resource limitations)	
Enablers for Successful Implementation	
From your experience, what are some key factors that can/ has facilitated the successful rollout of a workplace screening program in a new organization? Consider areas like: • Strong leadership buy-in and commitment from management • Availability of dedicated resources (personnel, space, equipment) • Existing infrastructure (e.g., medical facilities, communication channels) • Supportive government policies and funding mechanisms	
How supportive is the health system in aiding your role in supporting workplace screening? • Strong leadership buy-in and commitment from management • Availability of dedicated resources (personnel,	

space, equipment) • Existing infrastructure (e.g., medical facilities, communication channels) • Supportive government policies and funding mechanisms	
Identifying Potential Barriers	
From your perspective, what potential challenges or barriers do you face in implementing a workplace screening program in the organization? Consider areas like: • Industry-specific • Logistical arrangements (scheduling, space constraints) • Employee concerns about privacy, confidentiality, or work time disruption • Cultural sensitivities or lack of awareness about NCDs • Potential resource limitations (financial, human resources)	
Addressing Challenges and Creating Solutions	
How can these potential challenges be mitigated to ensure a successful program implementation? Leverage your experience with government programs to propose solutions Consider strategies like: • Adapting program elements to the	

organization's specific needs • Addressing employee concerns through effective communication and educational workshops • Utilizing existing resources and collaborating with relevant government departments	
Would you do this differently? How?	

QUANTITATIVE QUESTIONNAIRE

Understanding "Abling" behaviours for Non-Communicable Disease Screening in the Organized Sectors of Tamil Nadu by CFIR framework.

s.no	Industry details	Options	Skip to
1	Date & Time		
2	Name of the District		
3	Name of the block		
4	Name of the Industry		
	Demographic Information *(Respondent)*		
5	Age of the respondent	----------	
6	Gender of the respondent	1. Male 2. Female 3. Transgender	
7	Which state do you belong to?	1. Tamil Nadu 2. Others	
8	What is the highest level of education you have completed	1. Illiterate 2. Primary 3. Secondary 4. Senior Secondary 5. Undergraduate post-graduate and above	
9	Employment Status	Full-time Part-time Contract Other……	

10	What is your current designation?	……	
11	In which department are you currently working?	……	
12	What is the nature of your work in the current industry?	1.Day shift 2. Night shift 3. others (specify)	
13	Do you involved in working overtime in the current job?	1.Yes 2.No	If No skip 14
14	If yes how many hours per week you are working overtime?	…….	
15	How many years of total work experience do you have?	…….	
16	How many years of work experience do you have in the current industry?	…….	
17	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like [carrying or lifting heavy loads, digging, or construction work]?	Yes No	
18	Do you have any health insurance?	Yes No	If answer is No then skip up to Q 21

19	Do you have any company-based health insurance?	Yes No	
20	Have you ever used this health insurance?	Yes No	
21	If yes, which situation did you use it?	…….	
22	What is your Marital status?	1. Married 2. Unmarried 3. Divorced 4. Separated 5. Widower	
23	What is the size of your family?	……	
24	Family History of Diabetes	○ Father ○ Mother ○ Sister ○ Brother ○ Spouse ○ No family history	
25	Family History of Hypertension	○ Father ○ Mother ○ Sister ○ Brother ○ Spouse ○ No family history	
26	Have you already been diagnosed with Diabetes Hypertension	 Yes No Yes No	If No to bothS

			kipup to Q 31
27	How long ago have you been diagnosed? Diabetes HTN	…… (in months /Years)	
28	Where was it first diagnosed?	1. Workplace screening 2. Went for other treatment (accidental) 3. Community Screening camps 4. Others……	
29	Are you under medication for Diabetes Hypertension	Yes No Yes No	
30	Are you undergoing periodic monitoring for the NCDcondition?Diabetes Hypertension	Yes No Yes No	
31	Where did you get treatment regularly?	1. Govt health facility 2. Private health facility 3. Workplace 4. Others…….	
IMPACT OF SCREENING PROGRAMME			

32	Have you received any education or information about hypertension and diabetes screening from your employer/company?	Yes No don't know	
33	Do you know when was the screening program introduced in your industry?	Yes don't know	
34	If yes, When is the screening program introduced in your industry? (year)	----------	
35	What are the tests/screenings done in your industry?	……..	
36	Is work place-based screening is a mandatory Criteria in your Organization?	1.Yes 2.No 3. don't know	
37	How often is the screening programs are conducted in your industry?	1.Monthly once 2. Every 3months once 3. Every 6 months once 4.Annually once 5. occasionally 6. don't know	
38	Have you ever participated in a hypertension or diabetic screening program in the current workplace?	A) Hypertension -Yes -No B) Diabetic -Yes - No C) Both - Yes-No	If No for Both skip up to Q 46

39	What is the primary reason for not participating? (Check all that apply)	Lack of awareness about the screening programs Lack of time Work schedule conflict Concerns about stigma associated withhypertension/ diabetes Accessibility issues (e.g., lack of nearby screening facilities) Cost concerns Lack of employer support Other (please specify) ____	
40	Do you attend all the screening programs offered by your organization/ company?	Yes No	

41	Have you ever been diagnosed with hypertension or diabetes as a result of screening? Diabetes Hypertension	Yes No Yes No			
42	Have you made any lifestyle changes after undergoing screening for hypertension or diabetes?	Yes No			
43	Do you believe that screening for hypertension or diabetes has positively impacted your overall health and well-being?	Yes No			
44	Who recommends you get screened for diabetes or hypertension?	Employer Healthcare worker Family member Private doctor Family doctor Friends Awareness /campaigns Self awareness			
45	How convenient was the worksite screening for you in terms of Scheduling Location Waiting time	More convenient	normal	More difficult	

46	Did the workplace screening program encourage you to take action toward your health?	Yes No	
47	Did your supervisor or manager encourage you to participate in the screening program?	Yes No	
48	Do you have any concerns about the way the screening program is currently conducted?	.....	
Overall Program Perception			
49	Would you recommend this worksite screening program to your colleagues?	Yes No	
50	What could be done to improve the worksite screening program?	.....	
51	Do you feel the screening program has helped raise awareness about diabetes and hypertension among friends and family?	Yes No	
52	Would you be interested in participating in future screenings for NCDs or other health conditions offered by your company?	Yes No	
53	What are the diseases for which you suggest screening in your industry that would benefit employees?	----------	
54	How much your organization is supporting to the overall health of employees	Very much Average Not at all	
55	Does your organization offer • Diabetes-friendly food in the canteen	Yes No don't know Yes No don't know	

	• Diabetes-friendly snacks in the canteen • Hypertension-friendly food in the canteen • Hypertension-friendly snacks in the canteen	Yes No don't know Yes No don't know	
56	Do you have a gym in the industry?	Yes No don't know	
57	Do you have walking tracks in the industry?	Yes No don't know	
58	Do you have sessions for Yoga/ Zumba/another program in theindustry	Yes No don't know	
59	If yes, How frequently are the sessions conducted?	……	
60	Capture the location		