International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Prevalence of Physical Health Problems and Its Related Factors Among the Workers of Soap Industry

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ABSTRACT

The soap industry is a vital sector that employs a large workforce, often exposed to various occupational hazards. Workers frequently encounter chemicals, dust, and repetitive physical tasks that can lead to significant health issues. Understanding the prevalence of physical health problems among soap industry workers and identifying the contributing factors is crucial for improving workplace safety and worker well-being. By categorizing related factors into worker-related, industry-related, and job environment-related aspects, this study aims to provide a comprehensive insight into the occupational health challenges faced by soap industry workers. The aim of the study was to investigate and analyze the prevalence of physical health problems among the soap industry workers in Kozhikode district. This research aims to identify and understand the extent of health problems faced by these workers due to their occupational environment and activities. Objectives of the study were to estimate the prevalence of physical health problems of workers of soap industry, to identify the related factors of physical health problems among workers of soap industry, to find the association between physical health problems and its related factors, and to find association between physical health problems and selected socio-personal variables. The study's theoretical framework was based on Betty Neuman system model. 130 soap industry workers were selected by purposive sampling technique. Tool used were, semi structured Interview schedule to assess socio-personal variables, bio-physical data sheet to identify physical health problems, and checklist to assess related factors of physical health problems of soap industry workers. Study reveal that among 130 participants, 10.7% of participants had history of hypertension,10.1% of participants had diabetes and 6.9% of them had disc prolapse. 61.5% of participants were don't have the availability of PPE, 99.2% of them were not using PPE and 99.2% of participants did not undergo any training regarding the usage and maintenance of the PPE. 100% of participants had to bend repeatedly and sit for long time during working hours. 99.2% of participants had to stand for long time during working hours, 99.2% of participants did not underwent any training regarding first aid and 98.5% of participants had no access to first aid kit. 61.5% of participants had no cleaning facility after food and 66.4% of participants did not have access to clean drinking water facility. Significant association was found between the central nervous system problems, ocular problem and socio-personal variable like age of workers. Significant association was found between the ear problems and selected socio-personal variables such as training of soap making and years of work experience. Significant association was found between respiratory problems and socio personal variables like years of working experience,

Significant association was found between central nervous-system problems and job environment related factors. Significant association was found between ocular problems and job environment related factors.

Key words: physical health problems, soap industry workers.

CHAPTER 1
INTRODUCTION
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Introduction

Occupation is a fundamental aspect of human life, encompassing the various activities individuals engage in to earn a living, contribute to society, and fulfil personal desires and aspirations. The nature and conditions of one's occupation significantly influence their health and lifestyle, with considerable effects on both physical and mental well-being. A well-balanced occupational life fosters personal satisfaction, economic development, and societal progress, while safeguarding an individual's physical, mental, social, and spiritual health. Therefore, ensuring safe working conditions, fair wages, and opportunities for skill development is crucial for the well-being of both individuals and communities. According to the World Employment Confederation (WEC), the global labour force reached 3.63 billion in 2023[1].

With the growing demand for various goods, there has also been a rise in the need for products such as soaps, detergents, dishwashing solutions, laundry soaps and liquids, and shampoos. Today, consumers expect more from soap than just its basic function of handwashing. People look for products that not only eliminate 100% of bacteria but also leave their hands feeling soft, smelling pleasant, or serving other specific purposes. As a result, an increasing number of production and manufacturing facilities are being established to meet these diverse consumer needs.

Occupational health is a crucial component of workforce well-being, especially in industries where workers are exposed to physical, chemical, and ergonomic hazards. The soap industry, being a traditional manufacturing sector, involves processes that may present considerable health risks to workers. It is vital to understand the prevalence of physical health issues among these workers and identify the factors contributing to these challenges in order to develop effective preventive measures and enhance workplace health standards.

Need and significance

Studying the health issues faced by workers in the soap industry is important for several reasons. Firstly, it highlights labour conditions and workers' rights, helping to identify health problems and select appropriate preventive measures. This ensures that workers are treated fairly and have a safe working environment. Secondly, understanding these challenges contributes to improving efficiency and productivity within the industry. Furthermore, addressing health concerns can lead to higher employee satisfaction and retention, which in turn supports the overall development of both employees and the stability and growth of the industry.

Kerala's unique socio-economic landscape, labour laws, and cultural factors can influence worker conditions differently compared to other regions. By examining factors such as wages, working hours, occupational health and safety, and job satisfaction, researchers can tailor interventions and policies to address the specific needs of soap industry workers in Kerala, thus enhancing their well-being and the sustainability of the industry. Soap making, with its potential for small-scale production, can be

profitable and flexible. This business can be operated from home, offering flexible schedules and lower overhead costs, making it an ideal choice for entrepreneurs seeking a balance between work and personal life. In recent years, particularly after the COVID-19 pandemic, the number of small-scale soap units has increased. Under the Kudumbashree initiative, many of these units are now operated exclusively by women.

Studying the soap industry in Kozhikode offers valuable insights into the specific challenges and opportunities faced by workers in the district's soap industry. In India, the Drugs and Cosmetics Act of 1940 and the associated rules of 1945 regulate all manufacturing processes related to cosmetics and drugs, including the production of soap.

A study conducted by Yazar Karem, Johnson Stina[2], and colleagues examined ingredient data sheets for 97 detergents and labels for 204 cosmetic products available on corporate websites. The research identified several hazardous components commonly used in soap and other cosmetic products. Preservatives such as methylparaben, propylparaben, sodium benzoate, phenoxyethanol, and methylchloroisothiazolinone/methylisothiazolinone were frequently employed. Specifically, 9% of detergents contained parabens, 8% contained formaldehyde-releasers, and 28% contained iso-thiazolinones. Fragrances, including citronellol, butylphenyl methylpropional, limonene, hexyl cinnamic aldehyde, and linalool, were the most commonly detected, with fragrances present in 88% of the products. Parabens, which are used to preserve soap and prevent the growth of bacteria, mold, and yeast, are similar to formaldehyde in their action. However, certain chemicals in soaps, such as Triclosan, Sodium Lauryl Sulfate, Propylene Glycol, Phthalates, and synthetic fragrances, can irritate the skin or trigger allergic reactions like contact dermatitis. Additionally, fragrances like linalool, limonene hydroperoxide, hydroxyl-3-cyclohexene carboxaldehyde, tree moss absolute, isoeugenol, cinnamonyl alcohol, and cinnamaldehyde may cause photosensitivity or hives in some individuals. Formaldehyde, a chemical used in soap production, is a known carcinogen and has been linked to certain types of cancer. Individuals who are frequently exposed to it may be at an increased risk of developing health problems associated with this toxic substance.

A study conducted by Hatim Kbret, Yonus Kassabum et al investigated the prevalence of work-related injuries and the risk factors contributing to them among employees at the Etab Soap and Detergent Factory in Hawassa, Ethiopia[3]. The research aimed to assess the extent of work-related injuries and the factors influencing their occurrence. The study employed a cross-sectional design and included 181 randomly selected employees. The findings revealed that 69 (38%) of the respondents had experienced various types of accidents, with the nature of injuries varying depending on the work process and department. Despite this, 150 (82.9%) workers reported wearing personal protective equipment (PPE) while performing their duties. Chemicals were often identified as the primary cause of many injuries in the workplace. This highlights the importance of safety measures and protective equipment in mitigating the risks associated with the use of hazardous substances in soap and detergent manufacturing.

A study conducted in the UK focused on occupational physician reporting activities and the epidermal monitoring scheme[4], which involved dermatologists reporting cases of contact dermatitis. The study estimated that 8,129 cases of contact dermatitis were reported by occupational physicians, out of a total of 9,937 cases reported by dermatologists. The majority of these cases were observed in manufacturing industries. The study identified several key agents responsible for allergic contact dermatitis. The most common culprits included rubber (23.4%), nickel (18.2%), epoxies and other resins (15.6%), aromatic amines (8.6%), chromium and chromates (8.1%), fragrances and cosmetics (8.0%), and preservatives

(7.3%). In cases of irritating dermatitis, the most commonly reported agents were soaps (22.0% of cases), wet work (19.8%), petroleum products (8.7%), solvents (8.0%), and cutting oils and coolants (7.8%). This study highlights that the soap production industry carries a particularly high risk for allergic contact dermatitis, with soaps accounting for 22.0% of irritating dermatitis cases. This underscores the need for improved safety measures and protective practices for workers in the soap manufacturing sector.

It is crucial to study the physical health issues faced by workers in the soap industry, as the sector continues to expand. There has been limited research on occupational health hazards in this industry, particularly in our local context. Workers' awareness of these hazards is generally minimal. The soap manufacturing process involves exposure to carcinogenic agents, asthma-inducing substances, chemicals that can cause burns in the event of accidents, and allergens that may lead to conditions like eczema.

With the industry experiencing rapid growth, many new small-scale units are emerging. In Kozhikode district alone, there are currently 12 large-scale units and numerous small-scale ones. Workers in these units are highly susceptible to developing various physical health problems[3] due to their exposure to chemicals used in soap production and the physical risks associated with working with machinery. Chemical exposure may lead to respiratory issues, skin disorders, allergic reactions, eye irritation, and burns. Additionally, the loud noise in these environments can contribute to noise-induced hearing loss, while accidents and injuries are common. Ergonomic issues and thermal hazards further exacerbate the potential health risks in the workplace.

Based on an extensive literature review conducted by the investigator, it was found that no studies have been conducted specifically on the physical health problems faced by soap industry workers, especially in Kerala. As a result, the investigator has decided to conduct a study to examine the health issues among workers in the soap industry. This research aims to fill this gap in the existing literature and provide valuable insights into the occupational health risks in this sector.

Statement of the problem

A study to assess the prevalence of physical health problems and its related factors among the workers of soap industry in Kozhikode district.

Research Question

- What is the prevalence of physical health problems among the workers of soap industry?
- What are the related factors contributing to physical health problems among workers in the soap industry?
- Is there any significant association between the physical health problems and related factors?
- Is there any significant association between the physical health problems and socio -personal variables?

Aims

The aim of the study is to investigate and analyse the prevalence of physical health problems among the soap industry workers within Kozhikode district. This research aims to identify and understand the extent of health problems faced by these workers due to their occupational environment and activities.

Objectives

- Estimate the prevalence of physical health problems of workers of soap industry
- Identify the related factors of physical health problems among workers of soap industry
- Find the association between physical health problems and its related factors.
- Find association between physical health problems and selected socio-personal variables.

Operational definitions

Prevalence: Refers to the number of soap industry workers with physical health problems out of the total number of soap industry workers studied in selected soap industries of Kozhikode district.

Physical health problem: Refers to difficulties in physical functioning, experienced by soap industry workers in relation to integumentary problems, ocular problems, nervous system problems, cardio vascular problems, respiratory problems, gastro intestinal problems, and musculoskeletal problems among soap industry workers as measured by checklist to assess physical health problems of soap industry workers.

- **Nervous system problems:** It refers to history of frequent headache, giddiness, numbness of fingers and tingling sensation of fingers.
- **Integumentary problems:** It refers to history of itching,skin rashes, dry skin, skin decolouration, nail infection.
- **Ocular problems**: It refers to history of itching of eyes, watery eyes, blurred vision and redness of eyes.
- **Ear problems**: It refers to history of ear ache, ear infection, and ear discharges.
- **Nasal problems:** It refers to history of excessive sneezing, and epistasis.
- **Cardiovascular problems**: It refers to history of palpitation during work and chest pain
- **Respiratory Problems**: It refers to history of dyspnoea on exertion, frequent cough, blood in sputum and sore throat.
- **Gastro intestinal problems**; it refers to history of mouth ulcer, diarrhoea, loss of appetite, daily bowel movement.
- **Musculoskeletal Problems:** It refers to history of joint stiffness, joint pain and back pain.
- **Genito urinary problems:** It refers to history of pain on micturition, urgency for voiding and increased frequency of urination.
- **Burns:** It refers to injuries to the skin and underlying tissues caused by thermal, chemical, and electrical sources.
- **Underweight:** It refers to individual's BMI <18kg/m^2
- **Over-weight:** It refers to individual's BMI 25-30kg/m^2
- **Obesity**: It refers to individual's BMI>30kg/m^2.

Soap industry workers: An adult who is involved in the proportioning, mixing, compacting, curing, drying and packing soaps and detergents in a soap industry.

Soap industry: The soap industry is a production site of soap, that may be bath soap, washing soap, powder and solutions, dish washing soap or solution, hand wash and shampoo licensed by local self-government department of Kozhikode district. It includes largescale and small-scale units.

- **Large scale unit of soap industry**: Refers to a soap manufacturing and distributing unit, employing a substantial work force exceeding 10, where they are full-time employees engaged in various stages of production.
- **Small scale unit of soap industry**: refers to a soap manufacturing and distributing unit, employing a substantial work force not exceeding 10, where they are full-time employees engaged in various stages of production.

Socio personal variables: Refers to sample characteristics such as age, gender, educational status, annual income, residence, nativity, type of family, years of work experience, religion, type of work in

industry, pre- placement health examination, periodic health examination, history of covid-19 infection, availability of health services from industry, presence of any type of health insurance and training for soap making. Socio personal measures are measured by help of semi-structured interview schedule.

Related factors: Related factors are the attributes or characteristics that increase the likelihood of developing physical health problems among the soap industry workers. The related factors in this study include worker related factors, industry related factors and working environment related factors as measured by checklist.

- **Worker related factors**: refers to under-weight, over-weight and obesity, habit of smoking, habit of pan chewing, and habit of alcoholism.
- **Industry related factors:** refers to long working hours (greater than 8 hours per day), increased number of working days per week (working 7 days per week without off), insufficient breaks or mealtime(1-hour break for lunch and half an hour for tea break), unavailability of enough number of PPE, improper usage of PPE (insufficient number / quality / improper fit and usage of PPE - mask/respirator, safety goggles, face shield, gloves, aprons, and hat and lack of training for usage of personal protective equipment) repeated movements like lifting, pulling, pushing, bending, stationary and sedentary position. exposure to acids, dust of detergents, ingredients for fragrance, availability of first aid kit in industry, training for first aid, lack of proper ventilation and lighting.
- **Working environment related factors:** It refers to exposure or contact to extreme temperature, exposure to or contact with caustic soda which causes burns, exposure to loud noises, poor housekeeping and waste management (like accumulation of dust and debris, spillage of chemicals or materials, clutter and obstructions), inadequate waste management, handwashing and cleaning facility after food, safe drinking water facility, toilet facility, periodic medical examination of worker by industry, display of key safety rules, protocols and procedures in industry, presence of display- written safe operating procedure and safety guidelines in the industry, display of emergency phone numbers in industry, workers awareness about the safe working protocols and safety measures, availability of training regarding workplace safety accidents and control, history of reporting and explanations to supervisor and higher authority regarding the workplace accidents, presence of clear emergency response plan at workplace, presence of clear display of emergency exit, availability of adequate area for working, availability of fire-extinguisher, training to use the fire extinguisher, proper equipment and tool checking and maintenance.

Assumption: Soap industry workers are more prone get physical health problems.

Hypotheses

H1: There is a significant association between health problems and related factors.

H2: There is a significant association between the physical health problems and selected socio-personal variables among the soap industry workers.

Conceptual framework

A conceptual framework is defined as a structured set of interrelated concepts or abstract ideas, logically organized and aligned with a central theme (Polit & Hungler, 1995). It serves as a visual and theoretical representation of the anticipated relationships among variables, offering a systematic approach to understanding and explaining the research problem. This framework plays a crucial role in clarifying, organizing, and guiding the key concepts explored in the study.

The current research aims to examine the physical health issues and associated factors affecting workers in the soap manufacturing industry. To guide this investigation, the study adopts a conceptual framework

grounded in **Dr. Betty Neuman's Systems Model** (1995). Initially developed in 1970 at the University of California, Los Angeles, Neuman's model is informed by General Systems Theory and adopts a holistic perspective on health by incorporating physical, psychological, and social dimensions of human well-being.

Central components of Neuman's model include the uniqueness of each client, five interrelated variables, the role of the nurse, and an emphasis on prevention, health promotion, and rehabilitation. According to Neuman, individuals function as dynamic, open systems that are in constant interaction with their environment. These systems may represent individuals, families, groups, or communities. At the core of the model lies a basic structure encompassing essential factors for survival, such as genetic makeup, ego structure, and homeostatic body temperature.

Surrounding this core are several protective layers or "lines of defense," which include:

- **Line of Resistance**: Internal mechanisms that help defend against stressors, including immune responses, coping strategies, and energy reserves.
- **Normal Line of Defense**: The individual's typical wellness level, influenced by past experiences and environmental stressors.
- **Flexible Line of Defense**: The outermost buffer that offers adaptive protection and flexibility in response to situational demands or potential threats.

Each component of the model addresses variables associated with the physical, psychological, socio-cultural, developmental, and spiritual dimensions of the individual. The primary objective of the model is to prevent exposure to stressors, facilitate early detection of health-related issues, and support the restoration of client well-being following health disruptions.

Primary prevention aims to avert the onset of health problems by disseminating information on the use of personal protective equipment, encouraging healthy lifestyle practices, and implementing modifications within the occupational environment. Secondary prevention involves the identification and management of physical health issues among workers in the soap industry, emphasizing early detection and timely intervention.

Tertiary prevention focuses on sustaining system stability through rehabilitation efforts, including the referral of affected workers for specialized medical treatment and ongoing care.

In this study, primary prevention will be emphasized by educating workers on using personal protective equipment, adopting healthy lifestyle practices, and improving their work environment. Secondary prevention will focus on assessing the physical health problems among workers, while tertiary prevention will involve referring workers who experience health issues to appropriate healthcare providers.

Neuman categorizes stressors into three types. Which are, Intra-personal Stressors: Internal factors within the individual, such as psychological stress or physical illnesses. Inter-personal Stressors and external factors that involve interactions with others, such as conflicts or social pressures, and extra-personal Stressors that come from the environment, such as workplace hazards or socioeconomic conditions.

Stressors, whether intra-, inter-, or extra-personal, can penetrate the flexible and normal lines of defense, potentially leading to negative outcomes such as illness or injury. If the system's resistance is overwhelmed, the body's natural defences are activated, and the individual may experience health issues along the wellness-illness continuum. If enough energy is available, the system can recover, restoring balance, and re-establishing health.

By applying this Neuman Systems Model, the study aims to understand how different environmental and occupational stressors affect the health of soap industry workers and how the lines of defense can be strengthened to improve their overall well-being. The degree reaction is the amount of system instability that occurs after exposure of a stressor. As a part of reaction, a person system can adapt to a stressor. The adaptation is called reconstitutions. According to Neuman, specific interventions are used to maintain system stability. This include primary prevention, secondary prevention and tertiary prevention.

Primary prevention retain and secondary intervention attain and tertiary intervention maintain the system. In this study it is mainly focused on the primary prevention which include giving information about safe practices during working, maintaining healthy lifestyle and modification of occupational environment. Secondary prevention include assessment of physical health problems among soap industry workers and tertiary prevention includes reference of the workers who have physical health problems.

The clients in the present study are soap industry workers, is an open system, that continuously exposed with stressors from internal and external environment, which are intrapersonal, interpersonal and extra-personal in nature. The intra-personal stressors comprise age, gender, educational status, smoking, pan chewing, alcoholism and use of personal protective equipment. The interpersonal encompasses duration of work, years of exposure and presence of existing illness. The extra-personal stressors include religion, monthly income, health insurance policy and life insurance policy. This approach ensures a comprehensive resolution to the health challenges faced by soap industry workers while fostering a healthier and safer working environment. The degree of reaction refers to the level of instability in the system after exposure to a stressor. In response to a stressor, an individual's system can adapt, which is known as reconstitution. According to Neuman's model, specific interventions are necessary to maintain system stability, including primary prevention, secondary prevention, and tertiary prevention.

Primary prevention aims to retain system stability by preventing health problems before they occur. In this study, primary prevention focuses on providing workers with information about safe working practices, encouraging a healthy lifestyle, and modifying the occupational environment to reduce exposure to harmful stressors. Secondary prevention involves early detection and assessment of physical health problems among soap industry workers. By identifying issues early, interventions can be implemented to minimize further harm. Tertiary prevention focuses on maintaining the system after health problems have already occurred. In this study, tertiary prevention includes referring workers with physical health problems for appropriate treatment and rehabilitation.

By adopting this holistic approach, the study aims to comprehensively address the health challenges faced by soap industry workers, providing strategies for prevention and fostering a healthier, safer working environment. This model helps ensure that all aspects of the workers' well-being, from personal habits to environmental factors, are considered in the development of effective health interventions.

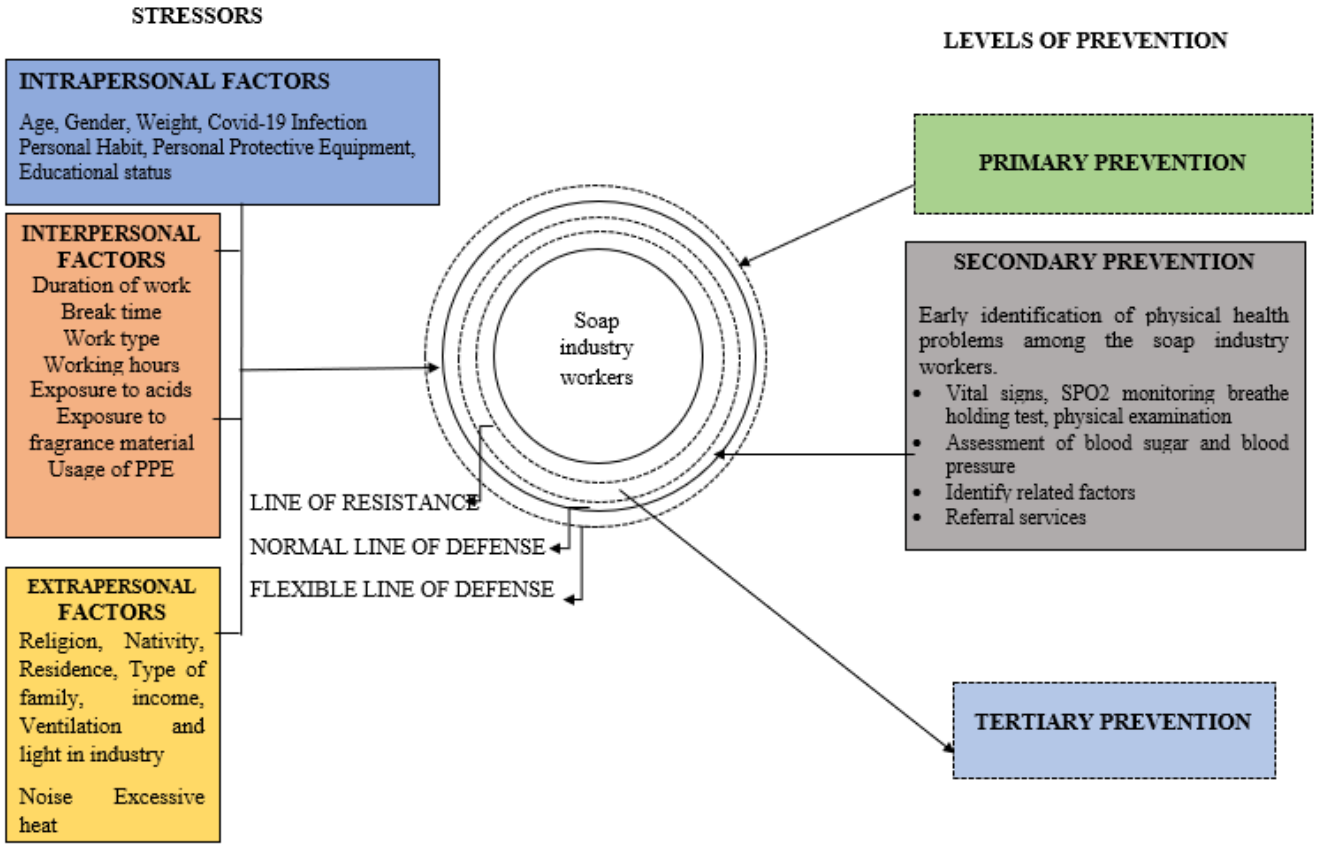

Figure 1. Conceptual frame work of the study based on Betty Neuman's system model

REVIEW OF LITERATURE

A comprehensive review of literature is a critical component of any research study, providing a comprehensive overview of existing knowledge, theories, and research findings related to the topic under investigation. It serves to establish the foundation of the study by summarizing previous research, identifying gaps in knowledge, and highlighting the significance of the present study. In the context of occupational health, reviewing relevant literature helps to understand the prevalence of physical health problems among workers, the factors influencing these issues, and the effectiveness of various preventive measures. In this study, the focus is on the prevalence of physical health problems and their related factors among soap industry workers. Occupational health concerns in such industries often arise due to exposure to physical, chemical, and ergonomic hazards, which can lead to conditions like musculoskeletal disorders, respiratory illnesses, dermatological problems, and other work-related health issues. The literature review explores studies that have examined these health problems in similar industrial settings and discusses how worker-related, industry-related, and job environment-related factors contribute to their occurrence.

The review of literature in this chapter is organized systematically to cover three key aspects:

1. Prevalence of Physical Health Problems – Examining studies that report on the common health conditions experienced by workers in industrial settings, with a focus on those in traditional and small-scale industries and large-scale industries.

2. Related Factors Affecting Workers' Health – Analyzing research on worker-related factors (such as demographic characteristics and personal habits), industry-related factors (such as exposure to chemicals, workload, and safety measures), and job environment-related factors (such as ventilation, workspace ergonomics, and working conditions).
3. Preventive Measures and Occupational Health Interventions – Reviewing literature on strategies to mitigate occupational health risks, including workplace modifications, personal protective equipment, health education programs, and policy recommendations.

By critically analyzing and synthesizing previous research, this literature review will help contextualize the study's findings, highlight gaps in knowledge, and provide a scientific basis for proposing interventions aimed at improving the health and well-being of soap industry workers.

1.Prevalence of health problems

Muyiwa O, Adeigbe F, et al[5]. (2005) assessed the ergonomic risks of musculoskeletal disorders associated with work in Nigerian soap manufacturing industries. The aim of the study was to evaluate the ergonomic risk of work-related musculoskeletal disorders (WMSDs) in the soap industry. The study involved twenty participants from four businesses, who were purposefully selected. Their work postures were then evaluated. Participants' experiences with musculoskeletal disorders were assessed using semi-structured oral questionnaires. The data collected from these surveys and observations were analysed using the Working Posture Analysis System and descriptive statistics. According to the descriptive statistics, participants reported experiencing pain or discomfort due to their work. The most commonly affected areas of the body were the neck (50%), elbows, ankles/feet (75%), shoulders, upper back (100%), and lower back. Participants identified the main cause of the pain as the repeated twisting and bending required when dragging soap cakes from the cylinder cooler hopper into the conveyor. To address the identified risk factors leading to work-related musculoskeletal disorders among soap makers, the study concluded that the workplace should be ergonomically redesigned. This could include reducing frequent bending and twisting during soap baking by implementing inclined conveyors and improving handling techniques.

A study conducted by Kathare M, Julander A, et al[6]. reviewed several records using data from the Swedish Products Register, hosted by the Swedish Chemicals Agency (KemI), national occupational injury and disease statistics, and call records from the Swedish Poisons Information Centre (PIC). The study aimed to characterize the health hazards associated with marketed cleaning products and to record injuries, diseases, and incidents linked to cleaning or disinfection agents. The findings indicate that cleaning agents present various health risks, with corrosion and irritation being the most common, particularly affecting the eyes (54% of all items reviewed). Few products were found to pose a risk of inhalation. Among the occupational disease cases linked to cleaning or disinfection products, 26% affected the respiratory system, while 61% affected the skin. Chemical burns accounted for 64% of occupational injury cases. However, cleaning or disinfection agents were specifically responsible for only a small portion (<0.5%) of all reported illnesses and injuries. Of those cases, 26% were respiratory-related, and 1% were skin-related. Chemical burns were the cause of 64% of occupational injury cases. In total, only 0.5% of all reported illnesses and injuries were directly linked to cleaning or disinfection products. On average, 11 incidents of illness related to cleaning or disinfection agents were reported for every million workers each year, while the corresponding figure for work-related injuries was eight. Although the statistics covered a wide range of industries and professions, manufacturing, lodging and

food service, and healthcare were the most notable sectors. Diseases were more common in women, while injuries occurred equally in both men and women.

A cross-sectional study was conducted by Ahmed AS, Ibrahim DA et al to assess the prevalence and possible risk factors of occupational asthma, as well as its impact on quality of life, among workers in the detergent and cleaning products industries in El Asher Men Ramadan City, Egypt[7]. The study involved 780 workers, who were personally interviewed at their workplaces. Participants completed a questionnaire covering sociodemographic details, work characteristics, and asthma symptoms. They also underwent clinical examinations, chest X-rays, spirometry tests, and a bronchodilator test. The prevalence of occupational asthma among the studied workers was found to be 35.4%. Multivariate logistic regression analysis identified several risk factors for the development of occupational asthma, including female gender, manual labour, and a history of atopy. The mean asthma-specific quality of life score was significantly lower in asthmatic workers compared to non-asthmatic workers, indicating a deterioration in the quality of life among those with asthma. The study concluded that workers in the detergent and cleaning products industry are at a higher risk of developing occupational asthma, which negatively affects their overall health and quality of life.

A comparative cross-sectional study was conducted by Bamidele JO in Nigeria[8] to assess the respiratory symptoms and peak expiratory flow rates of factory workers (study group) and office workers (control group) in a soap and detergent industry in Ilorin, in relation to the occupational hazards of chemical fumes and detergent dust. The study found that 67.5% of factory workers experienced upper respiratory tract infections, compared to 10.6% of office workers. The study indicated that factory workers were more exposed to workplace hazards (e.g., chemical fumes and detergent dust) than office workers. Personal protective equipment (PPE) such as boots, face masks, gloves, earmuffs, and goggles were not consistently used by the factory workers due to inadequate supply, worn-out equipment, and substandard quality. The study also observed a general reduction in the mean peak expiratory flow rate in factory workers compared to office workers, which may indicate the effect of long-term exposure to chemical fumes and detergent dust in the industry. The study emphasized the need for follow-up to detect early any potential diseases or complications arising from these occupational exposures.

A study conducted by F. Forastiere, S. Valesini, et al.[9] in Italy aimed to identify respiratory cancers among soap industry workers. It found that working in Italy's soap industry exposed workers to nickel dust and sulfuric acid fumes, both of which are suspected respiratory carcinogens. The study involved 361 male workers who had been employed in soap making for at least a year. A mortality study and an incidence study were conducted to investigate laryngeal cancer. Although the overall mortality rate was lower than expected, deaths from laryngeal and lung cancers were higher, though not statistically significant. One new case of laryngeal cancer was expected during the study period, but five cases were observed. The latency period for cancer development was more than ten years, and all the males who developed lung cancer had worked in the industry for several years.

Gushit and John Stephen et al[10]. (2010) conducted a study on the monitoring and characterization of airborne pollutants in a detergent production plant. They measured the indoor air quality (IAQ) of five workstations within the plant using the gravitational settlement method and characterized the particulate matter (PM). In addition, they performed a physical inspection of the plant premises to assess the quality of indoor air in the workstations, which could impact workers' health and performance. The mean values of the following air quality parameters were recorded within the ranges of 24.5–48.5 µg/m³.

A cross-sectional study conducted by Van Rooy, R. Houba et al[11], investigated sensitization and respiratory health among workers exposed to liquid enzyme detergents. The study involved 109 workers, and data were collected through questionnaires and blood samples. The results indicated that 14.2% of workers were sensitized to detergent enzymes, with higher levels of exposure leading to more frequent symptoms such as nasal itching and sneezing. The study concluded that exposure to these enzymes represents a significant occupational hazard, highlighting the need for improved hygiene practices and regular health surveillance.

2. Prevalence of health problems

A study on safety analysis in the soap and detergent industries was carried out by Vikas Kumar Sahul and T. Ramarao MTech in the Department of Mechanical Engineering at Bhilai Institute of Technology, Raipur[12]. The researchers, who were students, focused on soap and detergent plants in Chhattisgarh state and examined their occupational, incidental, and unintentional hazards. The study involved 171 employees (including laborers, operators, and supervisors) from 11 soap and detergent manufacturers. These workers were exposed to various risks and came into contact with all types of machinery and equipment used in the industry, such as boilers, crushers, mixers, extruders, cage mills, filter pans, storage tanks, and packing machinery. The safety analysis in this study was conducted using the Job Safety Analysis (JSA) technique, which involves incorporating recognized safety and health principles into specific tasks or job operations. The researchers found that the soap industry posed a high risk of accidents due to the use of chemicals, machinery, and hazardous conditions. Furthermore, many workers were unaware of these dangers.

A study was conducted to assess the relationship between labour commitment and firm productivity[13]. It also examined the impact of employees' sex, marital status, and occupational status on their commitment to work. A sample of 100 workers from Global Soap and Detergent Industries Limited, Ilorin, was selected for the research. Data was collected using an instrument titled “Labour Commitment and Productivity Questionnaire” (LCPQ), and the results were analyzed using statistical tables, simple percentages, and chi-square statistics. The findings showed a strong positive relationship between labour commitment and productivity. Additionally, the study revealed significant differences in work commitment based on marital status, gender, and occupational status, with differences between married and single employees, male and female employees, as well as junior and senior company staff. The assessment of physical problems among workers in the soap industry helps identify current occupational hazards and supports taking necessary actions to reduce these risks.

A study titled Respiratory Symptoms and Peak Expiratory Flow Rates in Workers of a Nigerian Soap and Detergent Industry was conducted by Niger J. M[14]. This comparative cross-sectional study aimed to assess the respiratory symptoms and peak expiratory flow rates of factory workers (study group) and office workers (control group) in a soap and detergent industry in Ilorin, in relation to occupational hazards such as chemical fumes and detergent dust. Upper respiratory tract infections were found in 67.5% of the study group, compared to 10.6% of the control group. The study showed that factory workers were more exposed to workplace hazards (e.g., chemical fumes and detergent dust) than office workers. Personal protective equipment such as boots, face masks, gloves, earmuffs, and goggles were not consistently used, as it was often in short supply, worn out, or of substandard quality. The study also observed a general reduction in the mean peak expiratory flow rates among factory workers compared to office workers. This finding may indicate the effect of long-term industrial exposure to chemical fumes

and detergent dust. The study emphasizes the need for ongoing monitoring of these workers to detect any potential diseases or complications early.

Another study conducted in France by C. Laraqui, K. Harourate et al[15]. assessed the prevalence of clinical symptoms and pulmonary function issues in two groups: one exposed to dust and chemicals and the other not exposed. The study used a retrospective survey, which included a questionnaire, chest X-rays, and several pulmonary function tests. The study involved 32 exposed workers and 42 non-exposed workers. The medical study also included questions about dust levels (weight of dust and enzyme activity) at the workplace. The results revealed that only 7% of the non-exposed workers experienced clinical respiratory symptoms, compared to 57% of the exposed workers. The prevalence of rhinitis, asthma, cough, chronic bronchitis, eczema, and conjunctivitis was significantly higher among the exposed group.

A study on industrial hygiene challenges conducted by Richard D. Fulwiler[16] found that primary irritant dermatitis, caused by excessive skin contact with concentrated forms of enzymes used in detergents, and respiratory allergies, manifested as acute airway obstruction due to the inhalation of enzyme dust, have been recognized in the detergent manufacturing industry. Both conditions returned to normal when exposure to the enzymes was adequately reduced or eliminated. The study describes a comprehensive industrial hygiene regimen that includes several control measures and chemical suppression of enzyme dust. Improved dust control and chemical suppression, along with a strong commitment from the plant, are identified as primary factors for the safe long-term handling of detergent enzymes. Additionally, an air evaluation program is briefly outlined, with air concentrations for dust and proteolytic enzymes reported for isolated operations.

A quasi-experimental study by Huwida Abd El-Kareem and Howayida Sadek Abd El-Hameed et al[17], assessed the impact of safety precautions and first aid procedures on workers in an oil and soap manufacturing setting. The study was conducted at the Oil and Soap Company in the Kafr El Zayat District of the Al-Gharbia Governorate. A sample of 250 employees was randomly selected. Two data collection instruments were used. A structured questionnaire, comprised of three sections, gathered information on the workers' sociodemographic characteristics, medical backgrounds, and awareness of workplace health risks, both before and after the program. An observational checklist, also with three components, assessed the use of personal protective equipment, pre- and post-program first aid protocols, and the environmental conditions before and after the intervention. Pre-program analysis revealed significant relationships between the workers' total knowledge scores and their age (less than 25 years) and education ($p > 0.05$). Post-program analysis showed no significant relationships between the workers' total practice scores and sex, residence, social status, monthly income, daily working hours, or years of experience. The researchers concluded that the intervention program effectively improved the workers' knowledge and practices. They recommended developing intervention programs for workers in oil and soap companies and providing health education programs to enhance first aid and safety measures.

Heather P Lampe and Powell[18] conducted a practical, clinically oriented study identifying various occupational irritants, ranging from well-known factors like wet work to less recognized ones like warm, dry air. They noted that many recognized occupational allergens are also common non-occupational allergens, and workplace-related contact allergens are prevalent. Patch testing, in conjunction with detailed employment histories and Material Safety Data Sheets (MSDS), was used to diagnose allergic contact dermatitis in the context of occupational contact dermatitis (OCD). The Mathias criteria were

applied to determine occupational causation. The study found higher rates of OCD in specific industries and occupations, particularly those involving direct contact with irritants and allergens. The differential diagnosis for occupational dermatitis is broad, encompassing conditions such as atopic dermatitis, psoriasis, and manifestations of internal disease, as well as overlap syndromes. OCD treatment should ideally follow a stepwise approach based on public health hazard controls. Prevention and early intervention are crucial for promoting occupational health and preventing OCD. The study noted a significant incidence of OCD in the metal and soap industries

3. Preventive Measures and Occupational Health Interventions

A study by Stephane A. Prince et al[19]. reviewed 38 papers and examined the impact of leisure-time physical activity (LTPA) and occupational physical activity (OPA) on health outcomes such as cardiovascular disease, musculoskeletal disorders, and mortality. It found that while physical activity is known to reduce mortality and the risk of chronic diseases, OPA does not provide the same health benefits as LTPA. Specifically, LTPA was more beneficial for workers in low-OPA jobs, offering greater health benefits compared to those in moderate or high-OPA jobs. This suggests that workers in physically demanding jobs may experience less protection from LTPA. The study also recommends tailored interventions for different occupational groups and calls for further research to determine the optimal amounts of LTPA needed for improved health outcomes.

A study by Markku Vanhanen, Timo Tuomi, and colleagues aimed to assess the prevalence of enzyme sensitization in the detergent industry[20]. The cross-sectional study was conducted at a detergent factory, where enzyme sensitization was tested using skin prick and radio-allergosorbent (RAST) tests. A total of 76 workers participated, with 40 workers from manufacturing, packing, and maintenance, and 36 non-exposed individuals from management and sales departments. Workers were interviewed about work-related respiratory and skin symptoms. Dust concentrations were measured using a gravimetric method, while protease levels in the air were assessed using a catalytic method. The results showed that 9 workers (22%) in the exposed group of 40 were sensitized to enzymes, whereas no sensitization was found in the non-exposed group. All the sensitized workers reported symptoms at work, including rhinitis, and one individual had asthma. The average protease concentrations were generally below 20 ng/m3, though occasional peak levels as high as 80 ng/m3 were detected.

The study by M. Cathcart et al[21], aimed to explore the long-term relationship between smoking, lung function, and enzyme exposure in employees within the detergent industry. The study followed 731 male workers across five sites in the United Kingdom over a period of 4 to 20 years, conducting regular respiratory health surveillance, including lung function testing. Exposure groups were defined based on job history. While no clear trends were observed regarding enzyme exposure, the study found that smoking habits and geographic location were associated with significantly different rates of decline in lung function, as measured by FEV1 and FVC, over time.

A study conducted by Takele Tadesse and Abera Kumie[22] was an institution-based cross-sectional comparative study, carried out from November to December 2004 in Gondar Wereda. A total of 962 employed workers from small and medium-scale industries were randomly selected for the study. Trained data collectors administered a pre-tested, standardized questionnaire, and physical examinations and record reviews were performed to confirm self-reported injuries. Data were entered and cleaned using EPI INFO version 6.04, and SPSS version 11.0 was used for descriptive and logistic regression analysis. The study found that the annual and two-week prevalence rates of work-related injuries were 335 and 120 per 1,000 exposed workers, respectively. Among the total work-related injuries, 114

(35.5%) occurred among small-scale industrial workers, and 208 (32.4%) occurred among medium-scale industrial workers. The prevalence and severity of injuries were not significantly associated with the type of industry. The primary factors contributing to work-related injuries in these industries were having a service duration of 5 years or less in the current job. The study concluded that preventive measures, including functional occupational health and safety programs, are essential to protect the health and safety of workers in small and medium-scale industries.

A study conducted by Addis Ababa Binet[23] from the Department of Management, Faculty of Business and Economics, Addis Ababa University, assessed job design and work measurement at the REPI Soap and Detergent Factory in Addis Ababa. This comprehensive study focused on understanding the design of work systems, specifically job design and work measurement. The study aimed to explain the methods and procedures used in designing jobs and measuring work, while also addressing other related issues. The study adopted a qualitative research design with the following objectives: to understand the processes and approaches involved in job design and work measurement, to identify potential problems arising from work system designs, to propose solutions to common challenges, to assess the impact of working conditions on job design, and to highlight the importance of work system design for society as a whole.

This chapter dealt with the review of the literature regarding the present study which includes the physical health problems and its related factors among the soap industry workers. Most of the study showed that the soap industry workers had physical problems like integumentary, respiratory, musculo-skeletal and ocular problems. Some studies stressed the relation between the occupational environment safety and the work- related injuries. Existing research studies on the topics pinpoints the need of extensive researchers to enlarge the world of evidence.

CHAPTER 2
METHODOLOGY, RESULTS, DISCUSSION

Research methodology

Research methodology is a way to systematically solve the research problem. It includes the research approach adopted, research design, variables, study setting, population, sample, development and description of tool, pilot study, method of data collection and plan for data analysis.

The present study was aimed to assess the prevalence of physical health problems and its related factors among soap industry workers in selected soap industries of Kozhikode district.

Research approach: The research approach is an overall plan or blueprint chosen to carry out the study. Quantitative non-experimental approach was chosen for the present study to assess the physical health problems and its related factors of soap industry workers in Kozhikode district.

Research design: Non-experimental-cross sectional design selected to conduct the present study. The design is most appropriate to collect the personal information.

Variables: Variables are quantities, qualities, properties or characteristics of people, things or situations that change or vary. The variables included in the study are physical health problems, socio-personal variables and related factors.

The socio-personal variables include age, gender, educational status, annual income, residence, nativity, type of family, years of work experience, religion**,** total work experience, type of work in industry, history of covid-19 infection, and existing illness.

The related factors in this study include worker related factors, industry related factors and working environment related factors. Worker related factors are underweight and overweight, habit of smoking, alcoholism and pan chewing. Industry related factors are total working hours per day, total working days per week, break time duration, availability of personal protective equipment, physical activity during work, exposure to acids, dust of detergents and ingredients for fragrance, training for first aid, ventilation and lighting. Environment related factors are exposure or contact to extreme temperature, Exposure to or contact with caustic soda which causes burns, Exposure to loud noises, Poor housekeeping and poor waste management, handwashing and cleaning facility after food, drinking water facility, periodic medical examination, presence of display- written safe operating procedure and safety guidelines, key safety rules display, presence of fire extinguisher in industry, and display of emergency phone number in the industry.

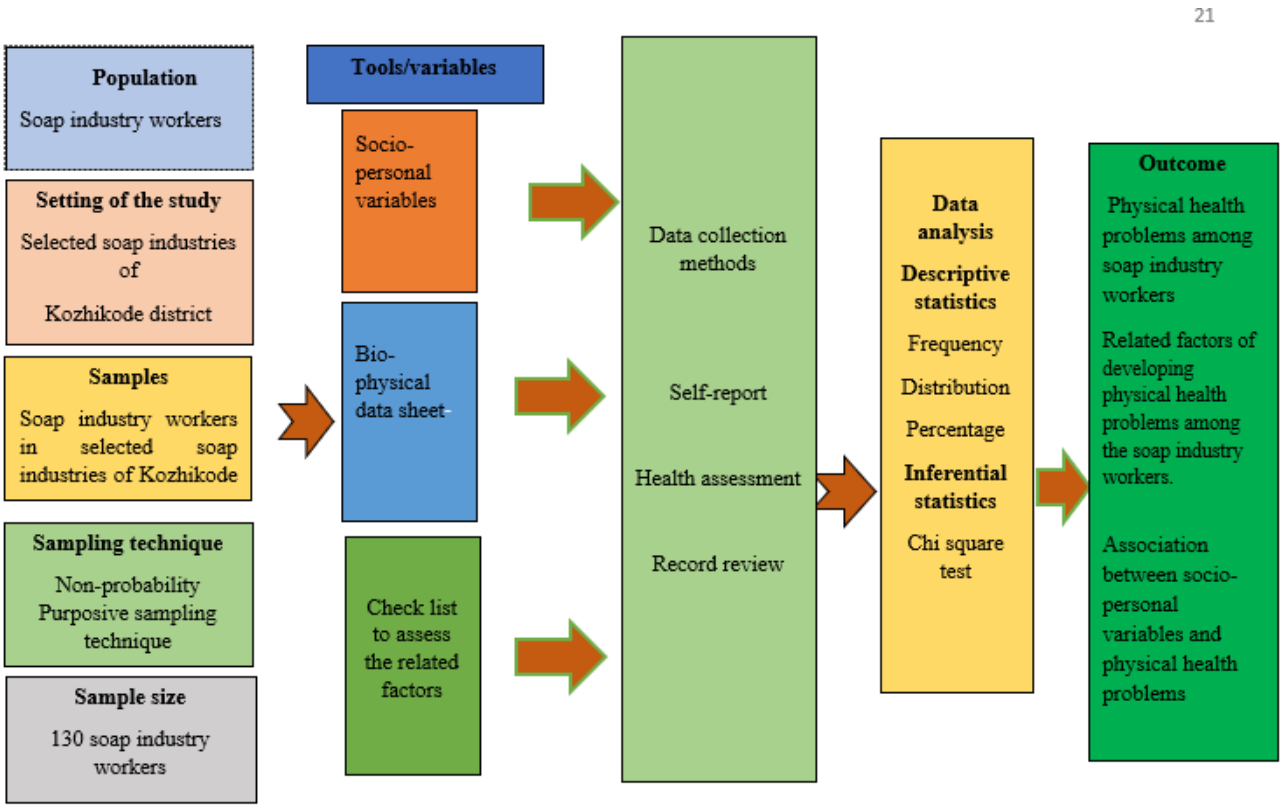

Figure 2: Schematic representation of study to assess the physical health problems and its related factors among soap industry workers.

Setting of the study

The setting is the physical location and condition in which data collection take-place. The study was conducted in the selected soap industry units of Kozhikode district.

Population

Population is the set of people or entities to which the result of the research study is to be generalised. In this study the target population is the soap industry workers.

Inclusion criteria

The soap industry workers who are

1. Willing to participate in study
2. Aged 18 years or old
3. Able to comprehend Malayalam

Exclusion criteria

The workers who are not present at the time of data collection.

Sample and the sampling technique

Sample is the subset of population selected for a particular study. Sample for the present study is the soap industry workers from selected soap industries of Kozhikode district.

Sample size:

Sample size is calculated by the formula n= 4pq/d2. p=8.6, study carryout in Puducherry[25]. A facility based cross- sectional descriptive study was done among workers of selected soap industries in Puducherry, for a period of 4 months, in 2018.p=8.6, q=91.4, d=5.

so, n=4*8.6*91.4/25=125.76, so, sample size is 130, in which 65 samples from large scale unit and 65 samples from small scale units were selected.

Tool/Instruments

In the present study the researcher used following tools

Tool 1	Semi structured Interview schedule to assess socio-personal variables.
Tool 2	Bio-physical data sheet. It includes Section A, B, C, and D. **Section A**- Assessment of vital parameters and Physical examination **Section B-** Subjective symptoms**:** Subjective symptoms include nervous system problems, integumentary problems, ocular problems, ear problems, nasal problems, cardio-vascular problems, respiratory problems, gastro-intestinal problems, musculo skeletal problems and Genito-urinary problems. **Section C-** History of workplace associated accidents: It includes falls, burns, injury, fracture, and chemical spillage during the work in the industry **Section D-** History of diagnosed diseases: The health records of worker to be reviewed for getting the diagnosed diseases.
Tool 3	Checklist to assess related factors of physical health problems of soap industry Workers. 1.Worker related factors 2. Industry related factors 3. Work environment related factors

Development/selection of the tool

The tool was selected based on the research problem. Investigator developed the tool to meet the objectives of the study. An extensive literature review was done for the development of the tool. The suggestions and the guidance of the experts and guide helped for the development of the tool. The following steps were taken in preparing the tool.

- Review of literature to obtain adequate content area and information.
- Consultation and discussion with nursing and medical experts.
- Discussion and consultation with research statistician.
- The finalsation of the tool was done with the guidance and suggestion of the guide.

Description of the tool

Tool 1: Semi structured Interview schedule to assess socio-personal variables.

Socio personal variables: Refers to sample characteristics such as age, gender, educational status, annual income, residence, nativity, type of family, years of work experience, religion, type of work in industry, pre- placement health examination, periodic health examination, history of covid-19 infection, availability of health services from industry, presence of any type of health insurance and training for soap making. Socio personal measures are measured by help of semi-structured interview schedule.

Technique: Interview

TOOL 2-Bio-physical data sheet: It includes Section A, B, C, and D

Section A-Assessment of vital parameters and Physical examination

1. Assessment of vital parameters: It includes measurements of weight, height and calculation of BMI, monitoring of pulse rate, respiratory rate, mean blood pressure, random blood sugar by glucometer and oxygen saturation by finger pulse-oximeter.

Mean blood pressure is calculated by calculate the pulse pressure (subtract the DBP from the SBP) and divide that by 3, then add the DBP.A normal MAP is between 70 and 100 mmHg.

BMI **is** interpreted by WHO guidelines

- BMI <18.5: underweight
- BMI 18.5-24.9: normal weight
- BMI ≥25.0-29.9 overweight
- BMI ≥30.0: obesity

Breath holding test: Seberere' s breath hold test

1. >25 sec- Normal cardiopulmonary reserve.
2. 15-25 sec -limited cardiopulmonary reserve
3. <15 sec-very poor cardiopulmonary reserve.

Spo2 is monitored by finger pulse oximeter. Random Blood sugar by Glucometer.

2. Physical examination: It includes assessment of central nervous system, integumentary system, cardio-vascular system, respiratory system, and musculo-skeletal system.

Section B - Subjective symptoms

Subjective symptoms are assessed by help of rating scale that includes 0-5 score 0 for absent /never,1- for sometimes, 2-for 1 to 2 times per week, 3 for several times per week and 4 for every day. Subjective symptoms include nervous system problems, integumentary problems, ocular problems, ear problems, nasal problems, cardio-vascular problem, respiratory problems, gastro-intestinal problems, musculo-skeletal problems and Genitourinary problems.

Section C- History of workplace associated accidents: It includes falls, burns, injury, fracture, and chemical spillage during the work in the industry

Section D- History of diagnosed diseases.

The health records of worker to be reviewed for getting the history of diagnosed diseases.

Technique: Direct assessment, self-report, record review.

Tool 3

Checklist to assess related factors of physical health problems of soap industry Workers.

1. Worker related factors
2. Industry related factors
3. Work environment related factors

Scoring of items- Scoring of some of the items are to be done by revers scoring.
Items included in reverse scoring are:
Industry related factors: C, D, E, P, Q, R and S
Work environment related factors: I, J, K, L, M, O, P, Q, R, S, T, U, V and W
Technique: self -report

Content validity

Validity of tool refers to whether the measuring instruments accurately measures what it is supposed to measure. To ensure the content validity the tool was given to 9 experts from different fields along with the blue print, objectives of the study and the response sheets. The experts include 7 from the field of nursing and 2 from the community medicine.

The experts were requested to give their opinions and suggestions regarding the relevance, adequacy, and appropriateness of the tool. After validation and modification, the tools were finalised based on the suggestions and modifications given by the experts and research guide.

Reliability of the tool

The reliability of the instrument is the degree of consistency with which it measures the attribute it is supposed to measure. The reliability of tools where assured using Cronbach's alpha method. Tool 2-section B Cronbach's alpha is .879 and Tool 3 checklist for related factors .902. The tools were found reliable.

Pilot study

After getting permission from Scientific Review Committee, Institutional Ethics Committee of Government College of Nursing Kozhikode, Kerala University of Health Sciences (KUHS) and from the management of various soap industries, pilot study was conducted from 09.12.24 to 21.12.24.

As per the inclusion criteria 13 samples were selected by non-randomised purposive sampling technique. Data was collected from the 6 workers of Panama soap factory, Kakkodi, Kozhikode and 7 workers from Freek soaps, Chelapram, Kozhikode.

The data collection timing was between 9 a.m to 4 p.m as per the duty timing of workers of different units. Participants were informed 2 days prior to bring health records if they have, for record review.

Participants were seated comfortably and the investigator introduced herself, explained about the purpose of the study and the tools used to collect data. After ensuring confidentiality of the data, informed consent was obtained from each participant, then tool was administeredSocio-personal data were collected by using the semi-structured interview schedule. It took nearly 5 minutes for obtain the socio-personal data. On the completion of this, investigator assessed the physical health problems by using bio-physical data sheet. It took around 15 minutes for the assessment of physical health problems and for the subjective symptoms per one participant.

Then a checklist was administered to get related factors. The average time taken to obtain the data of work-place associated illness, record review, and checklist was 10 minutes. The average time taken for the data collection was 30 minutes.

The pilot study revealed the appropriateness of the methodology and the comprehensibility then the adequacy of the selected tools. Collected data were organized, tabulated and was subjected to statistical analysis with the help of SPSS package. It was found that the data was amenable for statistical analysis and the study was found feasible.

Data collection process

Study was conducted after getting permission from Scientific review committee and Institutional Ethics Committee of Government College of Nursing Kozhikode, Kerala University of Health Sciences (KUHS) and from managements of various soap industries in Kozhikode district. Data were collected from 06/01/2025 to 16/02/2025. Study conducted at Rill soaps, Kunnamangalam, Kozhikode, Kabani Soaps Engappuzha, Kozhikode and 2 units of Sony Soaps, Feroke, Kozhikode. 130 samples were selected, who met the inclusion criteria, through non-randomised purposive sampling technique. The data collection timing was between 9 a.m to 4 p.m as per the duty timing of workers of different units. Participants were informed 2 days prior to bring health records if they have, for record review.

Participants were seated comfortably and the investigator introduced herself, explained about the purpose of the study and the tools used to collect data. Subject have assured full freedom to quit the study if they feel any inconvenience. After ensuring confidentiality of the data, informed consent was obtained from each participant, then tool was administered.

Socio-personal data were collected by using the semi-structured interview schedule. It took nearly 5 minutes to obtain the socio-personal data. On the completion of this, investigator assessed the physical health problems by using bio-physical data sheet. It includes assessment of vital parameters and physical examination. Then a 4-point rating scale was administered to get data about subjective symptoms. It took around 15 minutes for the assessment of physical health problems and for the subjective symptoms per one participant.

Then a checklist was administered to get related factors that is worker related factors, industry relate and environment related factors. The average time taken to obtain the data of work-place associated illness, record review, and checklist was 10 minutes. The average time taken for the data collection was 30 minutes. Those with health problems were referred to the concerned primary health centre. The study participants were very cooperative and willing to give necessary information. Collected data was organised. tabulated and later subjected to descriptive and inferential statistics with the help of SPSS version 18.

Plan for data analysis

1. Socio-personal variables of soap industry workers analysed by frequency and percentage
2. Physical health problems of soap industry workers analysed by frequency and percentage.
3. Chi square test done to find association between socio-personal variables and physical health problems
4. Chi square test done to find association between physical health problems and related factors

Section-wise presentation of data analysis and interpretation

This chapter presents the analysis and interpretation of data. It includes compilation, editing, coding, classification and presentation of data. In the present study to assess the physical health problems and its related factors among the soap industry workers, data were collected from 13 participants. The collected data were organized, tabulated and subjected to descriptive and inferential statistics with the help of statistical package SPSS. The analysis of data is presented under the following headings

Section 1- Socio-personal variables

Section 2- Physical health problems

Section 3- Related factors of physical health problems

Section 4-Association between physical health problems and selected socio-personal variables.

Section 5- Association between physical health problems and related factors

Section A-Socio-personal variables

This section deals with frequency distribution and percentage of participants based on sample characteristics such as age, sex, educational status, annual income, religion, residence, type of family, marital status, type of work in industry, year of experience, pre-placement health examination and periodic health examination, history of COVID, health services from industry, presence of health insurance and training for soap making.

The findings presented in Table 1 to 5

Table 1

Distribution of participants based on age, gender, educational status, type of family, total working experience in years, and religion.

(n=130)

Socio-personal variable	**f**	**%**
Age in years		
18-30	12	9.2
31-40	28	21.5
41-50	57	43.8
51-60	30	23.1
61-70	3	2.3
Gender		
Male	74	56.1
Female	56	43.9
Educational status		
No formal education	13	10
Primary education	72	55.4
High school education	44	33.8
Higher secondary education	1	0 .8
Type of family		
Nuclear family	114	87.7
Joint family	13	10
Extended family	3	2.3
Total working experience in years		
1-5	25	14.9
6-10	25	14.9
11-15	40	23.8
16-20	34	20.2
21-25	3	2.3
26-30	3	2.3
Religion		
Hindu	75	57.7
Muslim	41	31.1
Christian	14	10.8

Table 1 shows that 43.8% of the participants belonged to the 41–50 years age group, 56.1% of the participants were male, 55.4% had received only primary education, 87.7% of participants belonged to nuclear families, 23.8% of them had experience between 11–15 years, and 57.7% of participants belonged to the Hindu religion.

Table 2
Distribution of participants based on annual income, residence, and native place.
(n=130)

Socio-personal variable	**f**	**%**
Annual income in rupees		
1000- 25000	21	16.8
25001- 50000	91	70
50001- 75000	13	10
75001- 100000	6	3.2
Residence		
Corporation	20	15.4
Municipality	4	3.1
Panchayath	106	81.5
Native place		
Kerala	130	100

Table 2 shows 70% of the participants had an annual income ranging from ₹25,001 to ₹50,000. The majority (81.5%) resided in panchayat areas, and all participants were of Keralite origin.

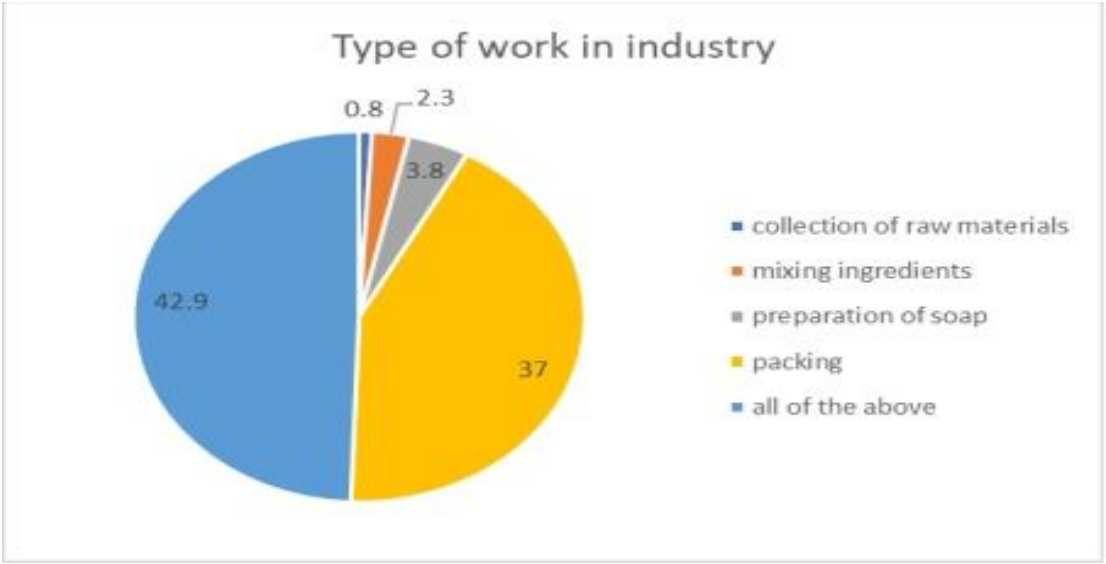

Figure 3: Type of work in industry

Figure 3 illustrates that 42.9% of workers were doing all kind of jobs in the industry.

Table 3
Distribution of participants based on availability of pre-placement health examination and availability of periodic health examination.
(n=130)

Socio-personal variable	f	%
Pre- placement health examination		
yes	13	10
no	117	90
Periodic health examination		
yes	25	19.2
no	105	80.8

Table 3 shows 90% of the participants had not undergone any form of pre-placement health examination, and 80.8% had not undergone any type of periodic health examination.

Table 4
Distribution of participants based on previous diagnosis of Covid- 19 infection.
(n=130)

Socio-personal variable	f	%
Previous diagnosis of COVID-19 infection		
Yes	21	13.2
No	109	83.8

Table 4 shows 13.2% of the participants had a history of COVID-19 infection.

Table 5
Distribution of participants based on availability of health services from industry, Health insurance, Training for soap making.
(n=130)

Socio-personal variable	Yes f	%	No f	%
Availability of health services from industry	67	51.5	63	48.5
Health insurance	67	51.5	63	48.5
Training for soap making	8	6.2	122	93.8

Table 5 shows 51.5% of participants were not received any type of health services from the industry, 51.5% of participants were **had** health insurance, and 6.2% participants were **received** training in soap making.

Section 2 Physical health problems

This section deals with the physical health problems among study participants which was assessed using bio- physical data sheet.

Table 6
Distribution of participants based on presence of physical health problems.
(n=130)

Physical health problems	**f**	**%**
Central nervous system problems	30	23.1
Integumentary problems	26	20
Ocular problems	17	10.1
Ear problems	8	6.2
Nasal problems	16	12.3
Cardio-vascular problems	1	0 .6
Gastro- intestinal problems	20	15.4
Musculo- skeletal problems	54	32.1
Genito- urinary problems	11	6.5

Table 6 shows 32.1% of participants had musculoskeletal problems and 23.1% of participants had central nervous system problems.

Table 7
Distribution of participants based on BMI, pulse rate and respiratory rate, blood pressure, random blood glucose, breath holding test, and oxygen saturation.
(n=130)

Bio- physical parameter	f	%
Body mass index		
Underweight(<18kg/m^2)	4	3.1
Normal(18-25kg/m^2)	74	56.9
Overweight (25-30kg/m^2)	44	33.8
Obese (>30kg/m^2)	8	6.2
Heart rate		
Normal (70-100beats/ minute)	125	96.2
Tachycardia (>100beats/minute)	5	3.8
Respiratory rate		
Eupnoea (18-22 breaths/ minute)	130	100
Blood pressure		
Normal MAP (70-100 mmHg)	85	65.4
High MAP (>100 mmHg)	45	34.6
Random blood sugar		
<140mg/dl	118	90.8
>140mg/dl	12	9.2
Breath holding test		
Normal cardiopulmonary reserve (>25 sec)	59	45.4
Limited cardiopulmonary reserve (15-25 sec)	55	4
Very poor cardiopulmonary reserve (< 15 sec)	16	12.3

Oxygen saturation		
Normal saturation	130	100

Table 7 shows that 56.9% of participants had a normal BMI, 96.2% had a normal heart rate, and 100% had a normal respiratory rate, 65.4% of participants had a normal mean arterial pressure, 90.8% had a normal blood sugar levels, 45.4% had a normal cardiopulmonary reserve, and all participants had a normal oxygen saturation.

Table 8
Distribution of participants based on history of workplace associated accidents.
(n= 130)

Type of accident	**f**	**%**
Falls	12	9.2
Burns	10	6
Injury	11	6.5
Fracture	2	1.5
Chemical spillage	1	9.2

Table 8 shows 32.4% of the participants had history of work-place accidents in the previous year.

Table 9
Distribution of participants based on central nervous system problems and integumentary system problems.
(n=130)

Physical health problems	**f**	**%**
Problems of Central nervous system		
Head ache	24	18.5
Giddiness	10	7.7
Numbness on fingers	11	8.5
Tingling sensation on fingers	2	1.2
Tremor	2	1.2
Integumentary problems		
Itching	22	16.9
Skin rashes	13	10
Dry skin	8	6.2
Skin discoloration	4	3.1
Nail infection	12	9.2
Macule	3	2.3
Papule	1	0.6
Pustule	1	0.6
Rashes	5	3.8
Scar	7	5.4

Brittle nail	6	4.6

Table 9 shows 18.5% of participants had head ache, 8.5% of them had numbness on fingers, 16.9 % of participants had itching of skin and 9.2% of participants had nail infection.

Table 10
Distribution of participants based on ocular problems, ear problems and nasal problems. (n=130)

Physical health problems	**f**	**%**
Ocular problems		
Itching eye	14	10.8
Watery eye	10	7.7
Blurred vision	1	0.8
Redness in eye	3	2.3
Exposure of chemical to eye	3	2.3
Ear problems		
Ear ache	5	3.8
Ear infection	4	3.1
Excessive discharge	5	3.8
Nasal problems		
Excessive sneezing	16	12.3
Bleeding nose	1	0.6

Table 10 shows 10.8% of participants had itching eyes, 7.7% of participants had watery eyes, 3.8% of participants had ear ache and excessive ear discharge, and 12.3% of participants had excessive sneezing.

Table 11
Distribution of participants based on cardio-vascular, respiratory and gastro-intestinal problems. (n=130)

Physical health problems	**f**	**%**
Cardio- vascular problems		
Palpitation during work	**1**	**0.6**
Respiratory problems		
Dyspnoea	**1**	**0.6**
Frequent cough	**5**	**7.4**
Blood in sputum	**1**	**0.6**
Gastro-intestinal problems		
Mouth ulcer	**7**	**5.4**
Diarrhoea	**5**	**3.8**
Loss of appetite	**8**	**6.2**
Constipation	**7**	**5.4**

Table 11 shows .6% of participants had palpitation during work, 7.4% of participants had frequent cough and 6.2% of participants had loss of appetite.

Table 12
Distribution of participants based on musculo- skeletal problems, and problems of genito- urinary system.
(n=130)

Physical health problems	**f**	**%**
Musculo- skeletal problems		
Joint stuffiness	22	16.9
Joint pain	47	36.1
Back pain	46	35.4
Kyphosis	1	0.6
Genito- urinary problems		
Urgency	1	0.8
Increased frequency Of micturition	11	8.5

Table 12 shows 36.1% of participants had joint pain and 35.4% of them had back-pain, 8.5% of participants had increased frequency of micturition.

Table 13
Distribution of participants based on diagnosed diseases.
(n=130)

Diagnosed diseases	**f**	**%**
Diabetes mellitus	17	10.1
Hypertension	18	10.7
Coronary artery disease	1	0.8
Varicose vein	3	2.3
Bronchitis	2	1.2
Asthma	2	1.2
COPD	2	1.2
Osteoporosis	5	3.8
Disc prolapse	9	6.9
Myopia	2	1.2
Allergies	6	4.6
Hypertropia	1	0.8
Cancer larynx	1	0.8

Table 13 shows 10.7% of participants had Hypertension,10.7% of participants had diabetes, and 6.9% of them had disc prolapse.

Section 3-Related factors

The related factors are categorized to worker related factors, industry related and work environment related factors. Each section given with score which is explained in table below. Part A included with worker related factors, Part B included with Industry related factors and Part C included with Job environment related factors.

Part 1

Worker related Factors

Table 14

Distribution of participants based on smoking habit, habit of alcoholism and pan chewing.

(n=130)

Characteristics	**f**	**%**
Smoking habit		
Smoker	24	14.3
Alcoholic	27	20.8
Pan chewer	7	5.4

Table 14 shows 14.3% workers were smokers and 20.8% of them were alcoholic.

Part 2

Industry related factor

Table 15

Distribution of participants based on working hours per day, working days per week and break time.

(n=130)

Industry related factor	**f**	**%**
Working hours per day > 8 hours	5	3.8
Total working days per week 7 days without off	2	1.2
Break time < 1 hour	9	5.4

Table 15 shows that 5.4% of the workers received less than one hour of break during a 9-hour shift.

Table 16

Distribution of participants based on availability of PPE and training of maintenance and usage of PPE.

(n=130)

Industry related factor	f	%
	absent	
PPE usage	129	99.2
Availability of PPE	80	61.5
Training on PPE usage	129	99.2

Table 16 shows that 61.5% of the participants did not have access to PPE and 99.2% were not using PPE and had not received any training regarding its usage and maintenance.

Table 17

Distribution of participants based on repeated lifting of weight, repeated pulling of weight, repeated pushing of weight, repeated bending during work, long sitting during work, and long-standing during work

(n=130)

Industry related factor	f	%
Repeated lifting of weight	124	95.4
Repeated pulling of weight	128	98.5
Repeated pushing of weight	127	97.7
Repeated bending during work	130	100
Long sitting during work	130	100
Long-standing during work	129	99.2

Table 17 shows that 100% of the participants had to perform repeated bending and prolonged sitting during working hours, while 99.2% had to stand for extended periods

Table 18

Distribution of participants based on exposure to Acids and cleaning solutions, exposure to dust, exposure to fragrance materials, training for first aid, availability of first aid kit, proper ventilation, and proper lighting.

(n=130)

Industry related factor	Yes f	 %	No f	 %
Exposure to Acids and cleaning solutions	121	93	9	7
Exposure to dust/detergent	130	100	0	0
Exposure to fragrance materials	127	97.7	3	2.3
Training for first aid	1	.8	129	99.2
Availability of first aid kit	2	1.5	128	98.5
Proper ventilation	22	16.9	108	83.1
Proper lighting	21	16.1	109	83.9
Exposure to caustic soda	65	50	65	50

Table 18 shows 93.1% of participants were exposed to acids and cleaning solutions, 100% of participants were exposed to dust,97.7% of them were exposed to fragrance material, 92.3% of participants do not having any training regarding first aid and 50% participants were having exposure to caustic soda.

Part 3

Work environment related factors

Table 19

Distribution of participants based upon temperature at work area, exposure to caustic soda, exposure to excessive sound, cleanliness at industry surroundings and waste disposal

(n=130)

Work environment related factor	**f**	**%**
Extreme temperature at work area	**Yes** **92**	**70.8**
Exposure to loud noise	**111**	**85.4**

Table 19 shows 70.8% of the participants worked in environments with extreme temperatures, and 85.4% were exposed to excessive noise.

Table 20

Distribution of participants based on adequacy of housekeeping facility, adequacy of waste management system and sanitation facility.

(n=130)

Work environment related factor	**f**	**%**
House keeping	**Poor** 96	73.4
Waste management system	124	84.6
Sanitation facility	121	92.3

Table 20 shows 92.3% of participants had poor sanitation facility and 84.6% of participants had poor waste management system.

Table 21

Distribution of participants based on cleaning facility after food and safe drinking water facility.

(n=130)

Work environment related factor	**f**	**%**
Cleaning facility after food	**Absent** 80	61.5
Safe drinking water facility	87	66.4

Table 21 shows that 66.4% of the participants lacked access to safe drinking water, and 61.5% did not have cleaning facilities available after meals.

Table 22

Distribution of participants based on reporting of presence/ absence of display of written safe operating procedures and safety guidelines at work-area, awareness of participant regarding safe operating procedures and safety guidelines, reporting of presence/ absence of display of key safety rules at workplace. availability of regular training on workplace-safety and hazard management, history of report of workplace hazard to supervisor and presence of clear emergency response plan at workplace.

(n=130)

Work environment related factors	**Yes f**	**%**	**No f**	**%**
Reporting of Display of written safe operating procedures - and safety guidelines at work-area	1	.8	129	99.2
Awareness of safe operating procedures	1	.8	129	99.2
Display of key safety rules at workplace	3	2.3	127	97.7
Availability of regular training on workplace safety and hazard management	2	1.5	128	98.5
History of report of workplace hazard to supervisor	123	94.6	7	5.4
Presence of clear emergency response plan at workplace	1	.8	129	99.2

Table 22 shows that 99.2% of workers did not have a display of written safe operating procedures and safety guidelines in their work area, and 99.2% of workers were unaware of safe operating procedures and safety guidelines at the workplace. Additionally, 97.7% of workers did not have a display of key safety rules at the workplace and 99.2% of workers did not have a clear emergency response plan at the workplace.

Table 23

Distribution of participants based on presence of regular safety inspections at workplace, presence of fire extinguisher in industry, availability of training to use fire extinguisher, display of emergency phone number, workplace cleanliness, adequacy of space for working, marking of emergency exit and accessibility, regular inspection and maintenance of equipment's and Feeling of safety from potential hazards.

(n=130)

Work environment related factors	**Yes f**	**%**	**No f**	**%**
Presence of regular safety inspections	1	.8	129	99.2
Presence of fire extinguisher in industry	3	2.3	127	97.7
Availability of training to use fire extinguisher	3	2.3	127	99.7
Display of emergency phone numbers	3	2.3	127	99.7

Workplace cleanliness	7	5.4	123	94.6
Adequacy of space for working	7	5.4	123	73.2
Marking of emergency exit and accessibility to exit	5	3.8	125	96.2
Regular inspection and maintenance of equipment's	2	1.5	128	98.5
Feeling of safety from potential hazards	12	9.2	118	90.8

Table 23 shows that 99.2% of workers did not have regular safety inspections at their workplace. Additionally, 97.7% of participants did not have access to fire extinguishers or training on how to use them, 34.7% of workers did not have adequate workspace, and 90.8% of them did not feel safe at their workplace.

Table 24

Distribution of participants based on presence of worker related factors, industry related factors and working environment related factors.

(n=130)

Related factors	**f**	**%**
Worker related factors	77	59.2
Industry related factors	130	100
Work environment related factors	130	100

Table 24 shows 100% of participants had industry- and work environment-related factors, and 59.2% of participants had worker-related factors.

Section-4

Association between physical health problems and related factors

This section deals with association between physical health problems and related factors among the soap industry workers. To find out the association between physical health problems and related factor, following null hypothesis is stated and tested at 0.05 level using chi square test.

H_0: There is no significant association between physical health problems and related factors.

For the purpose of finding the association between related factors and physical health problems, scoring of related factors are arbitrarily categorized to normal, moderate risk, and high risk. Related factors are divided to Worker related factors, Industry related factors, and job environment related factors. Total score of worker related factors is 4, industry related factors is 19 and job- environment related factors is 23the categorization is as follows.

If the score of worker related factor 0=normal, 1=low risk, 2 =moderate risk and 3 high risk. If the score of industry related factors is 0=normal, 1-5 =low risk 6-10 =moderate risk, 11-15 = high risk and 16-19 = very high risk. And regarding job environment factors 0= normal, 1-8=low risk, 9-16 moderate risk and 17-23 high risk.

Table 25

Association between central nervous system problems and related factors.

(n=130)

Related factors	**df**	**χ^2**	**p value**
Worker related factors	3	3.14	0 .370
Industry related factors	2	3.95	0 .138
Work environment related factors	2	8.36	0 .015*

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 25 shows Association between nervous system problems and related factors. The computed 'p' values for related factors-job environment related factors are less than 0.05. Hence the null hypothesis is rejected and it is interpreted that there is significant association between central nervous system problems and work environment related factors.

The computed p value for other related factors such as worker related factors and industry related factors are more than 0.05. Hence the null hypothesis is accepted and there is no significant association between central nervous system problems and these related factors.

Table 26

Association between integumentary problems and related factors.

(n=130)

Related factors	**df**	**χ^2**	**p value**
Worker related factors	3	7.25	0.064
Industry related factors	2	4.16	0.113
Work environment related factors	2	4.17	0.124

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 26 shows association between integumentary problems and related factors. The computed 'p' values for related factors are more than 0.05. Hence the null hypothesis is accepted and it is interpreted that there is no significant association between integumentary problems and related factors.

Table 27

Association between ocular problems and related factors.

(n=130)

Related factors	**df**	**χ^2**	**p value**
Worker related factors	3	.943	0.815
Industry related factors	2	.280	0.869
Work environment related factors	2	8.40	0.015*

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 27 shows association between integumentary problems and related factors. The computed 'p' values for job environment related factors are less than 0.05. Hence the null hypothesis is rejected and it is interpreted that there is significant association between ocular problems and work environment related factors.

The computed p value for other related factors such as worker related factors and industry related factors are more than 0.05, hence the null hypothesis is accepted and there is no significant association between ocular problems and these related factors.

Table 28

Association between ear problems and related factors.

(n=130)

Related factors	df	χ^2	p value
Worker related factors	3	.635	0.888
Industry related factors	2	1.491	0 .474
Work environment related factors	2	.559	0.476

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 28 shows association of ear problems and related factors, the computed 'p' values for related factors are more than 0.05. Hence the null hypothesis is accepted and it is interpreted that there is no significant association between ear problems and related factors.

Table 29

Association between nasal problems and related factors.

(n=130)

Related factors	df	χ^2	p value
Worker related factors	3	3.77	0.287
Industry related factors	2	.325	0.850
Work environment related factors	2	7.22	0.027*

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level.

Table 29 shows association of nasal problems and related factors, the computed 'p' values for job environment related factors are less than 0.05. Hence the null hypothesis is rejected and it is interpreted that there is significant association between nasal problems and work environment related factors.

The computed p value for other related factors such as worker related factors and industry related factors are more than 0.05. hence the null hypothesis is accepted and there is no significant association between nasal problems and these related factors.

Table 30

Association between cardio- vascular problems and related factors.

(n=130)

Related factors	df	χ^2	p value
Worker related factors	3	1.33	0.722
Industry related factors	2	.277	0.871
Work environment related factors	2	.066	0.976

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level.

Table 30 shows association of cardio-vascular problems and related factors, the computed 'p' values for related factors are more than 0.05. Hence the null hypothesis is accepted and it is interpreted that there is

no significant association between cardio- vascular problems and related factors.

Table 31

Association between respiratory problems and related factors.

(n=130)

Related factors	**df**	**χ^2**	**p value**
Worker related factors	3	7.73	0.05
Industry related factors	2	.289	0.883
Work environment related factors	2	.867	0.648

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 31 shows association of respiratory problems and related factors, the computed 'p' values for related factors are more than 0.05. Hence the null hypothesis is accepted and it is interpreted that there is no significant association between respiratory problems and related factors.

Table 32

Association between gastro-intestinal problems and related factors.

(n=130)

Related factors	**df**	**χ^2**	**p value**
Worker related factors	3	.823	0.868
Industry related factors	2	.689	0.708
Work environment related factors	2	.192	0.909

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 32 shows association of gastro intestinal problems and related factors, the computed 'p' values for related factors are more than 0.05. Hence the null hypothesis is accepted and it is interpreted that there is no significant association between gastro – intestinal problems and related factors.

Table 33

Association between musculo- skeletal problems and related factors.

(n=130)

Related factors	**df**	**χ^2**	**p value**
Worker related factors	3	9.62	0.022**
Industry related factors	2	4.36	0.113
Work environment related factors	2	6.57	0.037**

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level.

Table 33 shows association of musculo-skeletal system problems and related factors. The computed 'p' values for worker-related factor is less than 0.01. Hence the null hypothesis is rejected and it is interpreted that there is significant association between musculo skeletal problems and worker related factors. And the computed 'p' values for work environment-related factor is less than 0.01. Hence the null hypothesis is rejected and it is interpreted that there is significant association between musculo skeletal problems and work environment related factors.

The computed p value for other related factors such as industry related factors are more than 0.05. hence the null hypothesis is accepted and there is no significant association between musculo-skeletal problems and these related factors.

Table 34

Association between genito-urinary problems and related factors.

(n=130)

Related factors	**df**	χ^2	P value
Worker related factors	3	6.65	0.084
Industry related factors	2	18.0	0.055
Work environment related factors	2	32.23	0.001**

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 34 shows association of Genito-urinary problems and related factors, the computed 'p' values for related factors-work environment factor is less than 0.01. Hence the null hypothesis is accepted and it is interpreted that there is significant association between Genito-urinary problems and work environment-related factors.

The computed p value for other related factors such as worker related factors and industry related factors are more than 0.05. Hence the null hypothesis is accepted and there is no significant association between Genito-urinary problems and these related factors.

Section 5

Association between physical health problems and selected socio-personal variables

This section deals with association between physical health problems and selected socio-personal variables among the soap industry workers. To find out the association between physical health problems and selected socio-personal variables, following null hypothesis is stated and tested at 0.05 level using chi square test.

H_0: There is no significant association between physical health problems and selected socio personal variables.

Table 35

Association between Central nervous system problems, and selected socio-personal variables.

(n=130)

Selected socio-personal variable	**df**	χ^2	**P value**
Age	4	12.97	0.011*
Sex	1	.698	0.698
Educational status	3	.822	0.822
Years of work experience	5	.110	0.110
Training for soap making	1	.318	0.318

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 35 shows the association between central nervous system problems and selected socio-personal variables. The computed p value for the socio -personal variable Age (p value-.011) is significant at 0.05

level. Hence the null hypothesis is not accepted for the variable age. Thus, it is interpreted that there is a significant association between the central nervous system problems and age of workers.

The computed p value for other socio-personal variables such as sex, educational status, years of working experience is more than 0.05. hence the null hypothesis is accepted and there is no significant association between the central nervous system problems and these socio-personal variables.

Table 36

Association between integumentary system problems and selected socio-personal variables.

(n=130)

Selected Socio-personal variable	**df**	χ^2	**P value**
Age	4	2.582	0.630
Sex	1	.001	0.997
Educational status	3	.674	0.879
Years of work experience	5	1.936	0.858
Training for soap making	1	.636	0.425

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level.

Table 36 shows the association between the integumentary system problems and selected socio-personal variables. The computed p value for other socio-personal variables such as age, sex, educational status, years of working experience is more than 0.05. hence the null hypothesis is accepted and there is no significant association between the integumentary problems and these socio-personal variables.

Table 37

Association between ocular problems and selected socio-personal variables.

(n=130)

Selected socio-personal variable	**df**	χ^2	**p value**
Age	4	10.14	0.038*
Sex	1	.029	0.865
Educational status	3	3.14	0.371
Years of work experience	5	2.93	0.710
Training for soap making	1	1.01	0.302

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 37 shows the association between the ocular problem and selected socio-personal variables. The computed value for socio-personal variable age (p value=.038) is less than 0.05. Hence the null hypothesis is rejected and there is a significant association present between ocular problem and age.

The computed p value for other socio-personal variables such as sex, educational status, years of working experience is more than 0.05. hence the null hypothesis is accepted and there is no significant association between ocular problems and these socio-personal variables.

Table 38

Association between ear problems and selected socio-personal variables.

(n=130)

Selected socio-personal variable	df	χ^2	p value
Age	4	7.67	0.104
Sex	1	.108	0.742
Educational status	3	.197	0.978
Years of work experience	5	12.23	0.032*
Training for soap making	1	5.24	0.022*

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 38 depicts the association between the ear problems and selected socio-personal variables. In which the computed p value for the selected socio-personal variable years of work experience (p value .032) and years of training of soap making (p value-.022) were significant at 0.05 level, hence he null hypothesis is rejected and alternate hypothesis is accepted. So, there is a significant association is present in between the ear problems and selected socio-personal variables, years of work experience and training for soap making.

The computed p value for other socio-personal variables such as age, sex and educational status were more than 0.05. hence the null hypothesis is accepted and there is no significant association between ear problems and these socio-personal variables.

Table 39

Association between nasal problems and selected socio-personal variables.

(n=130)

Selected socio-personal variable	df	χ^2	p value
Age	4	3.77	0.473
Sex	1	.003	0.954
Educational status	3	1.02	.0796
Years of work experience	5	3.77	0.584
Training for soap making	1	1.19	0.274

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level.

Table 39 shows association between nasal problems and selected socio-personal variables. The computed p value for socio-personal variables such as age, sex, educational status, years of working experience and training for soap making were more than 0.05. hence the null hypothesis is accepted and there is no significant association between nasal problems and these socio-personal variables.

Table 40

Association between cardio-vascular problems and selected socio-personal variables.

(n=130)

Selected socio-personal variable	df	χ^2	p value
Age	4	3.35	0.500

Sex	1	1.33	0.249
Educational status	3	9.07	0.28
Years of work experience	5	4.23	0.516
Training for soap making	1	.06	0.797

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 40 shows association between cardio-vascular problems and selected socio personal variables. The computed 'p' values for selected socio personal variables are more than 0.05. Hence the null hypothesis is accepted and it is interpreted that there is no significant association between cardio vascular problems and selected socio personal variables.

Table 41

Association between respiratory problems and selected socio-personal variables.

(n=130)

Selected socio-personal variable	**df**	**χ^2**	**p value**
Age	4	2.32	0.67
Sex	1	.011	0.918
Educational status	3	.160	0.984
Years of work experience	5	13.25	0.021*
Training for soap making	1	2.53	0.112

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 41 shows association between respiratory problems and selected socio personal variables. The computed 'p' values for selected socio personal variables-years of working experience are less than 0.05. Hence the null hypothesis is rejected and it is interpreted that there is significant association respiratory problems and selected socio personal variables-years of working experience.

The computed p value for other socio-personal variables such as age, sex, educational status and training for soap making is more than 0.05. hence the null hypothesis is accepted and there is no significant association between respiratory problems and these socio-personal variables.

Table 42

Association between gastro-intestinal problems and selected socio-personal variables.

(n=130)

Selected socio-personal variable	**df**	**χ^2**	**p value**
Age	4	1.69	0.791
Sex	1	.091	0.763
Educational status	3	.503	0.970
Years of work experience	5	1.65	0.895
Training for soap making	1	.437	0.605

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 42 shows association between gastro-intestinal problems and selected socio personal variables. The computed 'p' values for selected socio personal variables are more than 0.05. Hence the null

hypothesis is accepted and it is interpreted that there is no significant association between gastro-intestinal problems and selected socio personal variables.

Table 43

Association between musculo- skeletal problems and selected socio-personal variables.

(n=130)

Selected socio-personal variable	df	χ^2	p value
Age	4	5.87	0.20
Sex	1	.009	0.925
Educational status	3	3.90	0.271
Years of work experience	5	6.22	0.285
Training for soap making	1	.009	0.925

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 43 shows association between musculo-skeletal problems and selected socio personal variables. The computed p value for other socio-personal variables such as age, sex, years of working experience and training of soap making is more than 0.05. hence the null hypothesis is accepted and there is no significant association between musculo-skeletal problems and these socio-personal variables.

Table 44

Association between genito- urinary problems and selected socio-personal variables.

(n=130)

Selected socio-personal variable	df	χ^2	p value
Age	4	.439	0.971
Sex	1	.028	0.868
Educational status	3	11.8	0.008**
Years of work experience	5	3.44	0.632
Training for soap making	1	.179	0.672

*Significant at 0.05 level **significant at 0.01 level ***significant at .001 level

Table 44 shows association between Genito-urinary problems and selected socio personal variables. The computed 'p' values for selected socio personal variables educational status is less than 0.01 Hence the null hypothesis is rejected and it is interpreted that there is significant association between Genito-urinary problems and selected socio personal variable- educational status.

The computed p value for other socio-personal variables such as sex, and training for soap making is more than 0.05. hence the null hypothesis is accepted and there is no significant association between Genito-urinary problems and these socio-personal variables.

Results

This chapter deals with the major findings of the study. The study was undertaken to assess the prevalence physical health problems of soap industry workers, to find the association between the physical health problems and selected socio-personal variables, and to find the association between the related factors.

Objectives

- Estimate the prevalence of physical health problems of workers of soap industry
- Identify the related factors of physical health problems among workers of soap industry
- Find the association between physical health problems and its related factors.
- Find association between physical health problems and selected demographic variables.

Hypotheses

- **H1:** There is significant association between health problems and related factors.
- **H2:** There is significant association between the physical health problems and selected socio-personal variables among the soap industry workers.

Results

The major findings of the present study are discussed under the following headings.

Section 1- Socio-personal variables

Section 2- Physical health problems

Section 3- Related factors

Section 4-Association between physical health problems and selected socio-personal variables.

Section 5- Association between physical health problems and related factors.

Section 1

Socio-personal variables

- Among the study participants, 43.8% of participants belonged to age group 41-50 years,23.1% of participants belonged to 51-60 years,21.5% of participants belonged to 31-40 years,9.2% of participants belonged to 18-30 years and 2.3% of participants belonged to 61-70 years.
- More than half of the (56.1%) of the participants were male.
- Among the study participants, 55.4% of participants had primary education.33.8% of participants had high school education, .8% of the participants had higher secondary education and 10% of them had no formal education.
- It is evident that 70% of participants belonged to the income range of 25001-50000, 16.8% of participants belonged to income range of 1000-25000, 10% of participants belonged to income range of 50001-75000, and 3.2% of them were belonged to 75001-100000.
- Majority of them residing at panchayath (81.5%)
- All of the participants were Keralite.
- Study shows 87.7 % of participants belonged to nuclear family,10% of them belonged to joint family and 2.3% of the workers belonged to extended family.
- Among the study participants, 23.8% had total work experience of 11-15 years, 20.2% of the workers had total experience of 16-20 years.
- Study shows 57.7% of participants belonged to Hindu religion.
- Out of 130 participants, 42.9% of workers were engaged in all kind of jobs in the industry, that is collection of raw material, mixing of ingredients, soap making and packing.
- Majority (90%) of participants did not undergo any type of pre- placement health examination
- Study shows 80.8% of participants did not undergo any type of periodic health examination
- Among the study participants, 13.2% participants had history of COVID- 19 infection.

- More than half of the participants (51.5%) not received any type of health services from the industry.
- Study shows 51.5% of participants had health insurance policy.
- Among the study participants, 6.2% workers received training for soap making.

Section 2

Physical health problems

- More than half of the 56.9% participants had normal Body Mass Index.
- Majority of the (96.2%) participants had normal heart rate.
- All of the (100%) of participants had normal respiratory rate.
- More than half of (65.4%) participants had normal mean arterial pressure.
- Majority of the participants (90.8%) had normal blood sugar
- Study shows 45.4% of workers had normal cardio-pulmonary reserve
- All of the participants (100%) had normal oxygen saturation.
- Out 130 participants, 32.4% of the participants had the history of workplace associated accidents in the previous year.
- Study shows, 32.1% of participants had musculoskeletal problems
- Among the study participants, 23.1% of participants had central nervous system problems.
- Study shows 18.5% of participants had head ache.
- Out of 130 participants, 16.9% of participants had itching of skin and 9.2% of them had nail infection.
- Study shows 7.7% of participants had watery eyes, and 10.8% of them had itching eyes.
- Among the study participants, 3.8% of participants had ear ache and excessive ear discharges, 12.3% of participants had excessive sneezing.
- Study shows, 6% of participants had palpitation during work.
- Among study participants, 7.4% of participants had frequent cough, .6% of them had blood in sputum and .6% of them had dyspnoea.
- Among study participants, 6.2% of participants had loss of appetite
- Study shows, 36.1% had joint pain and 35.4% of them had back-pain.
- Among the study participants, 8.5% of participants had increased frequency of micturition.
- Study shows, 5.4% of participants had scar and 9.2% of the participants had nail infection.
- Study shows 10.7% of participants had history of Hypertension,10.1% of participants had diabetes, and 6.9% of them had disc prolapse.

Section 3

Related factors

Worker related factors

It is evident that 14.3% workers were smokers and 20.8% of them were alcoholic and 5.4% of them had the bad habit of pan chewing.

Industry related factors

- Study shows, 5.4% of the workers were getting 1 hour for break in a 9-hour shift. 61.5% of participants were don't have the availability of PPE, 99.2% of them were not using PPE and 99.2% of participants did not undergo any training regarding the usage and maintenance of the PPE.
- Among the study participants, 100% of participants had to bend repeatedly and sit for long time during working hours. 99.2% of participants had to stand for long time during working hours.

- Study shows 95.4% of participants had to lift weight, 98.5% of participants had to pull weight, and 97.7% of participants had to push weight repeatedly during work.
- Majority of (93.1%) of participants were exposed to acids and cleaning solutions, all of the (100%) of participants were exposed to dust and detergent, 97.7% of them were exposed to fragrance material, and 50% of participants exposed to caustic soda.
- Out of 130 participants, 99.2% of participants did not underwent any training regarding first aid and 98.5% of participants had no access to first aid kit.
- Study shows 83.1% and 83.9% of participants had no proper ventilation and lighting respectively.

Work environment related factors

- Among the participants, 70.8% of participants were exposed to extreme at work area, and 85.4% of them were exposed to excessive sound and 73.8% of participants had poor housekeeping facility.
- Majority (92.3%) of workers did not have adequate sanitation facility and 84.6% of workers had poor waste management system at workplace, 61.5% of participants had no cleaning facility after food and 66.4% of participants did not have clean drinking water facility.
- Majority (99.2%) of workers were did not have display of written safe operating procedures and safety guidelines at work-area, 99.2% of workers were unaware of the need of safe operating procedures and safety guidelines at workplace and 97.7% workers did not have display of key safety rules at workplace.
- Majority (99.2%) of workers did not have a clear emergency response plan at workplace.98.5% of participants did not have availability of regular training on Workplace safety and hazard management and 94.6% of participants had history of report of workplace hazard - to supervisor.
- Study shows 99.2% of workers did not have regular safety inspection at their workplace.97.7% of participants did not have availability of fire extinguisher and training to use it.94.7% of the participants did not have clean work place. Majority of (97.7%) participants did not have display of emergency phone number at their workplace.
- Study shows 90.8% of the participants were not feeling safety from potential hazards at workplace.98.5% participants did not have regular inspection and maintenance of equipment's. 92.6% of participants did not have marking of emergency exit and accessibility to exit at their workplace.
- Study shows 100% of participants were have industry and work environment related factors and 59.2% of participants were have worker related factors.

Section-4

Association between physical health problemsand selected socio-personal variables

- Significant association was found between the central nervous system problems and selected socio-personal variable like age of workers ($\chi2$=12.97, p value= .011).
- Significant association was found between the ocular problem and selected socio-personal variables like age of workers ($\chi2$=10.14, p value=.038)
- Significant association was found between the ear problems and selected socio-personal variables training of soap making ($\chi2$=5.24, p value=.022) and years of work experience ($\chi2$=12.32, p value=.032)
- Significant association was found between respiratory problems and selected socio personal variables Years of working experience ($\chi2$=13.25, p value=.021)

- No significant association was found between selected socio-personal variables and integumentary problems, nasal problems, cardio-vascular problems, Genito urinary problems and musculo-skeletal problems.

Section 5

Association between physical health problems and related factors

- Significant association was found between central nervous-system problems and job environment related factors ($\chi2$=8.36, p value=.015)
- No Significant association was found between related factors and integumentary problems
- Significant association was found between ocular problems and job environment related factors ($\chi2$=8.40, p value=.015)
- No significant association was found between ear problems and related factors.
- Significant association was found between nasal problems and job environment related factors ($\chi2$=7.22, p value=.027)
- No significant association was found between cardio-vascular problems, respiratory problems, gastro-intestinal problems and related factors.
- Significant association was found between musculo-skeletal problems and job environment related factors ($\chi2$=9.62, p value=.022) and environment related factors ($\chi2$=6.57, p value=.037)
- Significant association was found between Genito-urinary problems and job environment related factors ($\chi2$=32.23, p value=.001).

Discussion

The present study aimed to assess the physical health problems and associated factors among workers in the soap industry. The findings of this study were compared with those of other relevant studies, and the results are discussed below.

One of the primary objectives of the present study was to estimate the prevalence of physical health problems, particularly musculoskeletal disorders, among workers in the soap industry. The study found that 36.1% of participants reported joint pain and 35.4% reported back pain. These findings align with a descriptive study conducted in Nigeria[2], which assessed ergonomic risks and work-related musculoskeletal disorders in soap-making units. The Nigerian study found that 100% of workers reported upper back pain, 75% had elbow and ankle/feet pain, and 50% had neck pain.

The findings of the present study revealed that 36.1% of participants reported joint pain, and 35.4% experienced back pain. These results are consistent with a review of epidemiological studies conducted between 1981 and 2005, using PubMed and PsychLit[29]. Among the 35 case studies reviewed, 17 studies, focused on respiratory diseases and 9 on dermatological conditions—both commonly associated with exposure to cleaning agents, wet work, and rubber latex.

The present study also found that 12.3% of participants reported excessive sneezing. This result is supported by a cross-sectional study of detergent workers exposed to liquid enzymes[11], which found that workers with the highest exposures reported significantly more work-related symptoms such as itching nose (prevalence ratio [PR] = 4.2) and sneezing (PR = 4.0). Similarly, the current study's finding of 12.3% prevalence of sneezing is in line with the aforementioned study, where 16% of participants reported work-related sneezing, with 5 of them sensitized to detergent enzymes.

The present study revealed that 0.8% of participants were diagnosed with laryngeal cancer. This finding is consistent with a study conducted by the Epidemiological Unit of the Latium Regional Authority, Rome, Italy[26], which found a 1.6% prevalence of laryngeal cancer among workers in the soap industry.
Additionally, the study found that 1.2% of participants had asthma, which is contradictory with another study conducted in Egypt[7] on occupational asthma among workers in the detergent and cleaning product industry. In that study, 35.4% of workers were diagnosed with occupational asthma, with 23.7% having been previously diagnosed and 11.7% being newly diagnosed.
In the present study, respiratory problems were evident among the participants, with 7.4% reporting frequent cough, 0.6% reporting blood in sputum, and 0.6% experiencing dyspnoea. These findings are consistent with those of a study on lung function, atopy, specific hypersensitivity, and smoking among workers in the detergent industry[27], which reported a 4.5% prevalence of respiratory problems.
In the present study, 16.9% of participants reported itching of the skin, 0.6% experienced dyspnoea, and 10.7% had hypertension. These findings were consistent with a study conducted in Puducherry, India[28], where 4.9% of workers experienced generalized pruritus, 4.6% experienced breathlessness, and 10.3% were newly diagnosed with hypertension.
The study found that 61.5% of participants lacked access to personal protective equipment (PPE), and 99.2% either did not use PPE or had not received training on its proper use and maintenance. These results contrast with findings from the Etab[3] Soap and Detergent Factory, where 82.9% of workers reported using PPE—though its availability varied by job category and working conditions. Notably, 17.1% of workers at Etab[3] did not use any PPE, underscoring persistent gaps in workplace safety practices.
In the present study, 6.5% of participants reported work-related injuries within the past year. This is consistent with findings from the Etab[3] Soap and Detergent Factory, where 38% of workers had been injured in the workplace. The types of injuries reported in the current study included burns (21.7%), fractures (27.5%), and falls (24.6%), with 3 participants (4.3%) reporting injuries due to exposure to chemicals, acids, or hot objects. These findings were similar to those of the Etab study, which reported a variety of injuries, including those related to exposure to hazardous materials.
The study also found that 90.8% of participants did not feel free from potential hazards in their work environment. This is consistent with findings from the study in Etab[3] soap factory, which indicated that 7% of workers felt unsafe or neglected in their work area. Moreover, 100% of participants in the current study reported having to perform repeated bending and prolonged sitting during working hours, and 99.2% had to stand for long periods. These ergonomic factors are consistent with a study on musculoskeletal disorders in the soap-making industry in Nigeria, which reported similar findings regarding physical strain.
In the current study, the educational background of the participants varied: 13 (10%) had no formal education, 72 (55.4%) had primary education, 44 (33.8%) had high school education, and 1 (0.8%) had higher secondary education. These findings were similar to those of a study assessing the prevalence and associated factors of work-related injuries among workers in the Etab[3] Soap and Detergent Factory in Hawassa, Ethiopia[3]. In that study, 2 (1.1%) had no formal education, 6 (3.3%) had primary education, 57 (31.5%) had education up to grade 5-8, 47 (26%) had education up to grade 9-12, 15 (8.3%) held a college certificate, and 30 (16.6%) had a diploma, with 18 (9.9%) holding a degree or higher.
The study also found that 24 (14.3%) workers were smokers, 27 (20.8%) were alcohol consumers, and 7 (5.4%) were pan chewers. These results were consistent with another study in Ethiopia[26], which reported

that 35 (19.3%) workers were alcohol users, 20 (11%) were pan chewers, and 7 (3.9%) were smokers. These behavioural factors are important to consider as they can contribute to health risks, including those associated with work-related injuries.

In terms of behavioural and environmental risk factors, the present study found that 20.8% of workers consumed alcohol and 98.5% had not received safety training. These findings are consistent with another study in Ethiopia[26], which identified a lack of safety training, low education levels, and alcohol consumption as significant risk factors for work-related injuries.

The findings of the present study provide valuable insights into the physical health problems and risk factors faced by workers in the soap industry. The prevalence of musculoskeletal disorders, respiratory problems, injuries, and lack of PPE use highlight the need for improved safety measures, better ergonomic practices, and increased safety training. These results are consistent with those of similar studies conducted in other regions, underlining the importance of addressing occupational health and safety issues in the soap industry.

CHAPTER 3

Limitation

- Generalisation of the study findings were limited as the study used purposive sampling technique
- Generalisation of the study also limited as the study confined the community under study.

Scope of future studies

- A similar study can be replicated on a large sample using random sampling method
- A study can be conducted at different soap industry to assess the workers knowledge regarding the occupational hazards.
- A study can be conducted to assess the musculo- skeletal problems of the workers and its contributing factor.
- A comparative study can be conducted on the prevalence of physical health problems in workers of small -scale unit and large -scale unit
- A similar study can be conducted to assess the risk of developing physical health problems in relation with presence of worker related, industry and work environment related factors.
- An interventional study may be undertaken on effectiveness of various awareness programmes in promotion of health of soap industry workers.
- A cohort study can be carried out of health outcome of soap maker over a long period of time.
- A study can be conducted to assess the integumentary-problems of the workers and its contributing factor.
- A study can be conducted to assess ergonomic risks of musculo-skeletal problems in soap industry.

CHAPTER 4

Conclusion

The present study was conducted to assess the prevalence of physical health problems and its related factors among the soap industry workers of selected soap industries in Kozhikode district. The study was conducted among 130 study participants. Study revealed out of 130 participants, 32.4% of the participants had the history of workplace associated accidents in the previous year. 32.1% of participants had musculoskeletal problems, 23.1% of participants had central nervous system problems,16.9% of participants had itching of skin,7.7% of participants had watery eyes, and 10.8% of them had itching

eyes, 12.3% of participants had excessive sneezing.36.1% had joint pain and 35.4% of them had back-pain. Study shows 10.7% of participants had history of Hypertension,10.1% of participants had diabetes, and 6.9% of them had disc prolapse.14.3% workers were smokers and 20.8% of them were alcoholic and 5.4% of them had the bad habit of pan chewing. 99.2% of them were not using PPE and 99.2% of participants did not undergo any training regarding the usage and maintenance of the PPE. 100% of participants had to bend repeatedly and sit for long time during working hours. 99.2% of participants had to stand for long time during working hours. 83.1% and 83.9% of participants had no proper ventilation and lighting respectively. 95.4% of participants had to lift weight, 98.5% of participants had to pull weight, and 97.7% of participants had to push weight repeatedly during work. 100% of participants were have industry and work environment related factors and 59.2% of participants were have worker related factors.

The study highlights the need of for enhancing the awareness of physical health problems that associated with the exposure to chemicals that used in soap making and the importance of use of personal protective equipment's. Along with that education to be given to the soap industry workers for using body mechanics while working, and to do simple exercises like ROM and stretching exercises as they were sit and stand for prolonged time during working hours.

Nursing implication

The findings of the study have implication in nursing practice, nursing education, nursing administration and nursing research.

Nursing practice

Knowledge of workers about the occupational health maintenance, presence of hazardous materials at the occupational environment, importance of usage of appropriate personal protective equipment, early detection of variation from the health, adaptation of healthy lifestyle, practice of appropriate strategy, work discipline, and most importantly their knowledge about their job is crucial for maintenance of health. Health education is the powerful weapon, a community health nurse can hold to give comprehensive, preventive and promotive care of workers at their work-place. The findings of this study highlight the significant prevalence of physical health problems among soap industry workers and their association with various worker-related, industry-related, and job environment-related factors. These insights emphasize the need for proactive nursing interventions to improve occupational health in this sector. Nurses and occupational health professionals can play a key role in implementing health education programs, promoting ergonomic workplace practices, and advocating for regular health screenings to identify and address health issues early. Additionally, collaboration with policymakers and industry stakeholders is essential to ensure safer work environments, reduce occupational hazards, and enhance overall worker well-being. By integrating these findings into nursing practice, healthcare professionals can contribute to the prevention and management of work-related health conditions, ultimately improving the quality of life for soap industry workers.

Nursing education

As educators, nurses play a crucial role in empowering workers, employers, and the community with knowledge and skills to prevent and manage occupational health issues. The study on the prevalence of physical health problems among soap industry workers underscores the need for enhanced nursing education in occupational health. The community health nurse can take role as Health Promoter to educate workers about personal hygiene, ergonomic practices, and safe handling of chemicals. Then preventive care advocate to conducting health screenings and promoting early detection of occupational

illnesses. As policy Influencer, community health nurse can advocate for improved workplace safety policies and better health infrastructure. By taking the role of capacity builder, she/he can provide training to workers and supervisors in first aid and workplace health management. Community health nurse can offer participatory learning activity for workers by engaging workers through interactive sessions, discussions, and real-life case studies. Community health nurse have the opportunities to demonstrate and to provide practical training on the use of personal protective equipment (PPE). nurse educator can use audio-visual presentations on ergonomic practices and chemical safety and encourage workplace safety manuals tailored for soap industry workers. Conducting workplace health programs and collaborating with soap-industries and public health officials is another aspect for promotion of occupational safety at soap industry. Community health nurse can use behavioural change model to encourage workers to adopt safer work habits and preventive health measures. Then regarding the utilizing community resources, partnering with local health departments for periodic health check-ups and vaccinations in Government sector. Collaborate with NGO's on awareness campaigns and health workshops. Involve nursing colleges in research and community outreach programs. Encouraging employers to invest in worker health programs and safety measures. Along these, community health nurse can do key role in Occupational Hazard Prevention by educating workers on the risks of chemical exposure, respiratory issues, and repetitive strain injuries, promoting proper ventilation, use of PPE, and workplace ergonomics, importance of conduction of periodic workplace assessments to identify and mitigate hazards and regarding self-care strategies such as hydration, proper posture, and stress management. By integrating these educational strategies, nurses can play a pivotal role in preventing occupational health issues, improving workers well-being, and strengthening community health nursing practices.

Nursing administration

In collaboration with business corporation, the nurses should make sure that they formulate and organize in-service education to supervisors and workers regarding occupational hazards and utilization of safety measures. Also, can focus on workforce management, policy implementation, and occupational health initiatives. Regarding the policy development & implementation, formulate occupational health policies specific to soap industry workers and ensure adherence to workplace safety regulations (e.g., use of PPE, ventilation, chemical handling protocols) then implementing health surveillance programs for early detection of work-related illnesses. Community health nurse have to conduct and manage, occupational Health Program by establishing regular health check-ups and medical screening for workers, coordinating with industrial management for hazard control measures and setting up first-aid and emergency response systems within the workplace. Ensuring availability of protective equipment, hygiene facilities, and adequate ventilation, allocating trained occupational health nurses to factories for monitoring and intervention, and implementing ergonomic workplace designs to minimize musculoskeletal problems. In the area of workforce training and capacity building, conducting occupational health training sessions for workers and supervisors, providing nurses with specialized training in industrial health nursing are effective. organizing workshops on early recognition of workplace-related illnesses are main area of focus. Community health nurse has to take initiative for collaboration with Industry and Government, partnering with industry stakeholders to promote worker-friendly policies, coordinating with governmental agencies (such as the Factory Inspectorate and Labour Department) for compliance and encouraging corporate social responsibility (CSR) initiatives for worker health and safety. Regarding monitoring and quality assurance, it is very important regular

assessment of workplace health conditions and reporting health trends and implementing quality assurance programs to evaluate the effectiveness of health interventions. Use evidence-based strategies to improve occupational health nursing practices. Legal and Ethical aspects are to be considered, ensure workers' rights to a safe work environment are upheld. Advocate for fair labour practices, including appropriate work hours and conditions. Addressing ethical concerns related to worker health and employer responsibilities is another concern. Conduct awareness classes for the workers regarding the workplace or occupational hygiene and first aid and management of accidents at work-place.

Nursing research

Nursing research is the vital evidence to practice nursing profession in up-coming years. Further research can explore long-term health impacts of industrial work on employees. Comparative studies between different industries can help identify sector-specific health risks. Intervention-based studies can assess the effectiveness of nursing-led occupational health programs. Future research to be focused on the long-term health effects of exposure to chemicals used in soap manufacturing. Researches to be conducted to compare the health status of workers in different industries to identify specific occupational risks. Additional research can explore mental health aspects, such as workplace stress and its impact on physical health, in industrial settings. Discussion to be initiated to explore the specific contributing factors for specific occupational health problems of soap industry workers.

CHAPTER 5

Summary

The present study was conducted to assess the prevalence of physical health problems and its related factors among the soap industry workers.

Objectives of the study were following

1. Estimate the prevalence of physical health problems of workers of soap industry.
2. Identify the related factors of physical health problems among workers of soap industry.
3. Find the association between physical health problems and its related factors.
4. Find association between physical health problems and selected socio-personal variables.

The study was attempted to examine the following hypotheses

H1: There is a significant association between health problems and related factors

H2: There is a significant association between the physical health problems and selected socio-personal variables among the soap industry workers.

The conceptual framework formulated for the study was based on Betty Newman system model, which focus on stressors and primary, secondary and tertiary prevention. The present study focuses on primary and secondary prevention.

In the study various literature were reviewed, which includes the literature related to physical health problems related to exposure to chemicals that used in soap making, the hazardous environment at industry that causing occupational diseases.

The research design selected for the study was descriptive research design. The participants in the study comprised of 130 soap industry workers from selected soap industries at Kozhikode district. Purposive sampling technique were used for the selection of the participants.

Tool used to collect the data were Semi-structured Interview schedule to assess socio-personal variables, bio-physical data sheet and checklist to assess the related factors of physical health problems of the soap industry workers.

Pilot study was conducted from 9/12/24 to 21/12/24 As per the inclusion criteria 13 samples selected and data collected for the pilot study from the 6 workers of Panama Soap Factory, Kakkodi, Kozhikode. and 7 workers from Freek Soaps, Chelapram, Kozhikode. Pilot study revealed the appropriateness of the methodology selected and clarified the comprehensiveness of tools. The collected data were amenable to statistical analysis and the study was proved to be feasible.

Main study was conducted in Rill soaps, Kunnamangalam, Kozhikode. Kabani Soaps Engappuzha, Kozhikode and 2 units of Sony Soaps Feroke, Kozhikode. Data collection period for main study was from 6.01.2025 to 16.02.2025. data was collected from 3-4 participants per day by purposive sampling technique. Based on the objectives and hypotheses of the study, data was analysed using descriptive and inferential statistics. Based on the analysis of the data, the findings of the study were presented. After analysis of the data following major results were obtained.

- Among the study participants, 43.8% of participants belonged to age group 41-50 years,23.1% of participants belonged to 51-60 years,21.5% of participants belonged to 31-40 years,9.2% of participants belonged to 18-30 years and 2.3% of participants belonged to 61-70 years.
- More than half of the (56.1%) of the participants were male.
- Among the study participants, 55.4% of participants had primary education.33.8% of participants had high school education, .8% of the participants had higher secondary education and 10% of them had no formal education.
- It is evident that 70% of participants belonged to the income range of 25001-50000, 16.8% of participants belonged to income range of 1000-25000, 10% of participants belonged to income range of 50001-75000, and 3.2% of them were belonged to 75001-100000.
- Majority of them were residing at panchayat (81.5%)
- All of the participants were Keralite.
- Study shows 87.7 % of participants belonged to nuclear family,10% of them belonged to joint family and 2.3% of the workers belonged to extended family.
- Among the study participants, 23.8% had total work experience of 11-15 years, 20.2% of the workers had total experience of 16-20 years.
- Study shows 57.7% of participants belonged to Hindu religion.
- Out of 130 participants, 42.9% of workers were engaged in all kind of jobs in the industry, that is collection of raw material, mixing of ingredients, soap making and packing.
- Majority (90%) of participants did not undergo any type of pre- placement health examination
- Study shows 80.8% of participants did not undergo any type of periodic health examination
- Among the study participants, 13.2% participants had history of COVID- 19 infection.
- More than half of the participants (51.5%) not received any type of health services from the industry.
- Study shows 51.5% of participants had health insurance policy.
- Among the study participants, 6.2% workers received training for soap making.
- More than half of the 56.9% participants had normal Body Mass Index.
- Majority of the (96.2%) participants had normal heart rate.
- 100% of participants had normal respiratory rate.
- More than half of (65.4%) participants had normal mean arterial pressure.
- Majority of the participants (90.8%) had normal blood sugar
- Study shows 45.4% of workers had normal cardio-pulmonary reserve

- All of the participants (100%) had normal oxygen saturation.
- Out 130 participants, 32.4% of the participants had the history of workplace associated accidents in the previous year.
- Study shows, 32.1% of participants had musculoskeletal problems
- Among the study participants, 23.1% of participants had central nervous system problems.
- Study shows 18.5% of participants had head ache.
- Out of 130 participants, 16.9% of participants had itching of skin and 9.2% of them had nail infection.
- Study shows 7.7% of participants had watery eyes, and 10.8% of them had itching eyes.
- Among the study participants, 3.8% of participants had ear ache and excessive ear discharges, 12.3% of participants had excessive sneezing.
- Study shows, 6% of participants had palpitation during work.
- Among study participants, 7.4% of participants had frequent cough, .6% of them had blood in sputum and .6% of them had dyspnoea.
- Among study participants, 6.2% of participants had loss of appetite
- Study shows, 36.1% had joint pain and 35.4% of them had back-pain.
- Among the study participants, 8.5% of participants had increased frequency of micturition.
- Study shows, 5.4% of participants had scar and 9.2% of the participants had nail infection.
- Study shows 10.7% of participants had history of Hypertension,10.1% of participants had diabetes, and 6.9% of them had disc prolapse.
- It is evident that 14.3% workers were smokers and 20.8% of them were alcoholic and 5.4% of them had the bad habit of pan chewing.
- Study shows, 5.4% of the workers were getting 1 hour for break in a 9-hour shift. 61.5% of participants were don't have the availability of PPE, 99.2% of them were not using PPE and 99.2% of participants did not undergo any training regarding the usage and maintenance of the PPE.
- Among the study participants, 100% of participants had to bend repeatedly and sit for long time during working hours. 99.2% of participants had to stand for long time during working hours.
- Study shows 95.4% of participants had to lift weight, 98.5% of participants had to pull weight, and 97.7% of participants had to push weight repeatedly during work.
- Majority of (93.1%) of participants were exposed to acids and cleaning solutions, all of the (100%) of participants were exposed to dust and detergent, 97.7% of them were exposed to fragrance material, and 50% of participants exposed to caustic soda.
- Out of 130 participants, 99.2% of participants did not underwent any training regarding first aid and 98.5% of participants had no access to first aid kit.
- Study shows 83.1% and 83.9% of participants had no proper ventilation and lighting respectively.
- Among the participants, 70.8% of participants were exposed to extreme at work area, and 85.4% of them were exposed to excessive sound and 73.8% of participants had poor housekeeping facility.
- Majority (92.3%) of workers did not have adequate sanitation facility and 84.6% of workers had poor waste management system at workplace, 61.5% of participants had no cleaning facility after food and 66.4% of participants did not have clean drinking water facility.
- Majority (99.2%) of workers were did not have display of written safe operating procedures and safety guidelines at work-area, 99.2% of workers were unaware of the need of safe operating

procedures and safety guidelines at workplace and 97.7% workers did not have display of key safety rules at workplace.

- Majority (99.2%) of workers did not have a clear emergency response plan at workplace.98.5% of participants did not have availability of regular training on Workplace safety and hazard management and 94.6% of participants had history of report of workplace hazard - to supervisor.
- Study shows 99.2% of workers did not have regular safety inspection at their workplace.97.7% of participants did not have availability of fire extinguisher and training to use it.94.7% of the participants did not have clean work place. Majority of (97.7%) participants did not have display of emergency phone number at their workplace.
- Study shows 90.8% of the participants were not feeling safety from potential hazards at workplace.98.5% participants did not have regular inspection and maintenance of equipment's. 92.6% of participants did not have marking of emergency exit and accessibility to exit at their workplace.
- Study shows 100% of participants were have industry and work environment related factors and 59.2% of participants were have worker related factors.
- Significant association was found between the central nervous system problems and selected socio-personal variable like age of workers ($\chi2$=12.97, p value= .011).
- Significant association was found between the ocular problem and selected socio-personal variables like age of workers ($\chi2$=10.14, p value=.038)
- Significant association was found between the ear problems and selected socio-personal variables training of soap making ($\chi2$=5.24, p value=.022) and years of work experience ($\chi2$=12.32, p value=.032)
- Significant association was found between respiratory problems and selected socio personal variables Years of working experience ($\chi2$=13.25, p value=.021)
- No significant association was found between selected socio-personal variables and integumentary problems, nasal problems, cardio-vascular problems, genito urinary problems and musculo-skeletal problems.
- Significant association was found between central nervous-system problems and job environment related factors ($\chi2$=8.36, p value=.015)
- No Significant association was found between related factors and integumentary problems
- Significant association was found between ocular problems and job environment related factors ($\chi2$=8.40, p value=.015)
- No significant association was found between ear problems and related factors.
- Significant association was found between nasal problems and job environment related factors ($\chi2$=7.22, p value=.027)
- No significant association was found between cardio-vascular problems, respiratory problems, gastro-intestinal problems and related factors.
- Significant association was found between musculo-skeletal problems and job environment related factors ($\chi2$=9.62, p value=.022) and environment related factors ($\chi2$=6.57, p value=.037)
- Significant association was found between genito-urinary problems and job environment related factors ($\chi2$=32.23, p value=.001).
- The socio-personal factors which are significantly associated with physical health problems were Age of workers, years of work experience and training for soapmaking.

- The related factors which are significantly associated with physical health problems of soap industry workers were worker related factors and job environment related factors.

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