LUNG FUNCTION, RESPIRATORY SYMPTOMS, SKIN PROBLEMS AND CHEMICAL EXPOSURES –
A CROSS-SECTIONAL OCCUPATIONAL HEALTH STUDY AMONG FEMALE HAIRDRESSERS IN HEBRON CITY, PALESTINE

by

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شكرا جزيلا

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ABBREVIATIONS

COPD: chronic obstructive pulmonary disease

CI: Confidence interval

GTG: Glyceryl thioglycolate

IR: incidence rate

IRR: incidence rates ratio

MOH: Ministry of Health

MSD: Musculoskeletal Disorders

MSDS: Material safety data sheet

NGOs: Non-Governmental organizations

OEL: Occupational exposure limits

OR: Odds ratios

OSHA: Occupational safety and health administration

PEL: Permissible exposure limits

PHC: Primary health care

PPE: Personal protective equipment

RR: Risk ratio

SPSS: Statistical Package for Social Sciences

TLV: Threshold limit value

UN: United Nations

UNRWA: United Nation Relief and Work Agency

WHO: World Health Organization

TERMINOLOGY

Asthma: Is a chronic respiratory disease characterized by airway hyper responsiveness and variable airflow obstruction, that is often reversible spontaneously or under treatment (1). This can cause wheezing, coughing, chest tightness and trouble breathing, especially early in the morning or at night (2).

Atopy: A collective term covering a variety of symptoms and observations regarding the hypersensitivity of the skin and mucous membranes. It is the genetic tendency to develop the classic allergic diseases: atopic dermatitis, allergic rhinitis (hay fever), and asthma. Atopy involves the capacity to produce immunoglobulin E (IgE) in response to common environmental proteins such as house dust mite, grass pollen, and food allergens (3).

Body Mass Index (BMI): A key index for relating a person's body weight to their height. The body mass index (BMI) is a person's weight in kilograms (kg) divided by their height in meters (m) squared (kg/m^2) (3). According to World Health Organization, BMI<18.50 is considered as underweight, 18.50 to 24.99 is normal weight, 25 to 29.99 is overweight and $\geq$30.00 is obese (4).

Dermatitis: Inflammation of the skin, either due to contact with an irritating substance, or to an allergic reaction. Symptoms of dermatitis include redness, itching, and in some cases blistering (5).

Forced vital capacity (FVC): A measure of the amount of air you can exhale with force after you inhale as deeply as possible, expressed in liter (6). A lower than normal value may indicate an obstructive problem in which the flow through the tubular passageways of the lung will be reduced. It may also indicate a restrictive lung disease in which the total volume of the lung will be smaller than normal which will lead to reduced lung capacity.

Forced expired volume in one second (FEV_1): A measure of the amount of air you can exhale with force in one breath at one second, expressed in liter (6). A lower than normal value may indicate an obstructive lung disease.

Peak expiratory flow (PEF): A measure of how quickly you can exhale (7). It is measured at the same time with the forced vital capacity, expressed in liter/second (6). A lower than normal value may indicate an obstructive disease.

Forced expiratory flow 25 to 75% ($FEF_{25-75\%}$): A measure of the air flow in the middle halfway through an exhale (FVC) (6). Also known as the air flow during forced vital capacity manoeuvre measured between 25% & 75% of the obtained FVC, expressed in liter/second (7). A lower than normal value may indicate an obstructive airway disease.

Forced expiratory flow at 75% ($FEF_{75\%}$): A measure of the air flow when 75% of the FVC was exhaled (8). Also known as the air flow during forced vital capacity manoeuvre measured at 75% of the obtained FVC, expressed in liter/second (7).

Hand eczema**:** Is an eczema that predominantly and persistently affects the hands; of multiple causation, including allergic, industrial, irritant, bacterial, and atopic mechanisms.

Henna: is a water soluble powder derived from leaves and roots of a Mid-eastern shrub. It is reddish-orange and used as a hair and cosmetic dye (9).

Spirometry: Is a physiological test that measures how an individual inhales or exhales volumes of air as a function of time. The primary signal measured in spirometry may be volume or flow (7).

ABSTRACT

Title
Lung function, respiratory symptoms, skin problems and chemical exposures – A cross-sectional occupational health study among female hairdressers in Hebron City, Palestine.

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Background
Hairdressers are exposed to chemicals and work tasks which may be harmful to their health. Studies have shown that this group of working women have a high incidence of both asthma and skin problems. The information on the prevalence of respiratory and skin symptoms caused by (reactive) chemicals used in hairdressing salons is limited. Most previous studies have been done in Europe and other developed countries. So there is a need of similar studies from developing countries to describe the occurrence and severity of respiratory and skin problems among hairdressers, and to investigate the associated factors. A study on the health situation in the hairdressing salons in Palestine will contribute to increased awareness about occupational health risks in the country.

Objectives
The main objective of the present study was to assess respiratory symptoms, respiratory effects and skin health problems among female hairdressers in Hebron City, Palestine. The specific objectives were to study work conditions in the salons and investigate the knowledge among hairdressers about their exposure and potential adverse health effects of their occupation. Another specific objective was to give preliminary estimates of the association between exposure at work and those health problems.

Methodology
A cross-sectional study was conducted, using random sampling procedure, and including 170 (87% response) female hairdressers working in 56 salons in Hebron City. The participants filled in a modified version of an internationally accepted questionnaire which collected information about working history, health status and knowledge. Lung function test was performed and a checklist was filled in by the researcher for each salon, describing the conditions and chemicals being used.

Results
The prevalence of respiratory symptoms was as follow; 19% for wheezing, 31% for tightness in the chest, 25% for shortness of breathe, 17% for coughing and 22% for phlegm. Asthma prevalence was 5.9% and hand dermatitis was 13.5%. The mean FVC was 3.31 liters (SD = 0.44) which was 96.5% of predicted as compared to European standards. For FEV_1, the mean value was 2.74 liters (SD = 0.60) which was 92.4% of predicted value of the European standards.

Preliminary crude analyses showed, for some of the end points, significantly more self-reported respiratory symptoms among the group of hairdressers with high exposure level as compared to lower exposure level, and lower mean of the main two lung function measurements (FVC and FEV_1).

Little knowledge was found among the hairdressers about the chemicals they are using and its harmful effect on their health. However, high percent (74%) of the ones with hand dermatitis linked this problem to their work conditions.

Conclusion
Our study showed that female hairdressers in Hebron City, Palestine are exposed to chemicals that might have adverse effects on their health and that the health symptoms were worse among the highly exposed group with higher intensity of work. However, association between exposure and outcome should be further analyzed with multivariate techniques.

There is clearly a need of increasing the awareness of occupational health hazards, as the knowledge was limited in this sample of female hairdressers. More research is needed in this field and more follow up studies would be useful to investigate the effect of exposure on health among this group of workers.

Key words
Hairdressing, occupational health, occupational asthma, hand dermatitis, chemical exposures.

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This study was funded by NUFU "Building Competence in Epidemiology in Palestine- Pro 50-2002".

Chapter One

BACKGROUND AND INTRODUCTION

I. BACKGROUND AND INTRODUCTION

1.1. Background

Hairdressers are exposed to several chemicals in their workplace. The chemicals present in hair styling and care products, may have irritant and sensitizing effects both on the airways and the skin (10;11). Most research on exposure to chemicals among hairdressers has been conducted in developed countries (12-20), while few studies have been conducted in developing countries (21-23).

In developed countries, occupational diseases are prevalent and many studies have shown high risk of occupational disorders such as asthma among different workers because of exposure to hazardous chemicals and gases (24).

In the Middle East countries, including Palestine, no studies on occupational health among hairdressers have been conducted as far as the author knows. The hairdressing workers in Palestine use several hair styling techniques such as; hair dying, bleaching, permanent waves, cutting, and other styling and finishing methods (25). During these tasks they usually use several products which may increase the risk of health problems like asthma, bronchitis, allergies and dermatitis.

In Hebron, male hairdressers do not have female customers, thus, they are probably not exposed to all the tasks performed by female hairdressers. They mainly do cutting with almost no handling of chemical products like bleaches and dyes. For this reason, it was more useful to study the health effects among female hairdressers.

It is not known whether Palestinian women working in hairdressing salons have any knowledge about possible adverse health effects from exposure to the products they are using or not. It is also not known if they suffer from any health problems. It is also possible that they are using different products than what is being used in developed countries. By this study we hope to increase the awareness about occupational health risks in Palestine.

We formulated the following research questions before we started the planning of the study;

- Are the female workers in hairdressing salons in Palestine exposed to chemicals which may cause adverse health effects on skin and respiratory system?

- What is the occurrence of respiratory symptoms, respiratory function problems and skin health problems?
- Is there an association between intensity of work and respiratory and skin health problems?

1.2. Introduction

1.2.1. Exposures in hairdressing occupation

The hairdressers may be exposed to the following work tasks:

- Hair cutting, which includes the use of scissor or razor, and often requires wet hair which exposes the fingers to water (26). As in this task metallic scissors are used, it has been found that the metal from which those scissors are made contains a combination of elements including nickel (27).
- Dying by applying hair dyes and other associated substances to the hair or sections of the hair using hands and brushes (26).
- Bleaching, in which hairdressers use an oxidizing powder mixed with an alkaline solution to help remove the hair colour (28). During the mixing process of the bleach, a fine dust is produced; which is readily inhaled by the hairdresser (29).
- Washing and conditioning the hair, both before cutting and after application of dyes and bleaches, using shampoos and conditioners (26).
- Waving or perming, using permanent wave material, which is made of an alkaline solution in addition to an organic acid, to give a stable curl to the hair (26).
- Styling and spraying, using different kinds of hairsprays, gels, waxes and hair creams (26).

In some situations, personal protective equipment (PPE); such as gloves, masks and goggles may be used because it is a way of minimizing exposures. Gloves are used to protect hands from continuous exposure to wet work conditions and chemicals; while protective masks are used to reduce exposure to dust and goggles are used for eye protection. All are of importance when mixing chemicals (30). However, the type of gloves is also of importance, as latex gloves are known to have a resistance to chemicals, but they can also cause skin allergies (26). Moreover, frequent or continuous wearing of gloves may cause sweating which could develop irritant dermatitis (26).

Some studies have tested the effect of protection of skin among hairdressers (19). One study found a positive association between the prevalence of hand dermatitis and the use of protective measures, suggesting that this outcome might result from the interaction between the material used in the synthesis of the gloves and skin rather than exposure to different materials used in different hairdressing tasks (19).

Hairdressing workshops need ventilation to reduce inhaling of hazardous substances (31). Natural ventilation does not provide a sufficient air change to control exposure to those substances but mechanical ventilation will limit the exposure of hazardous substances throughout the salon (32).

A study conducted in six hairdressing salons in Norway to describe the chemical exposure level and the effect of local exhaust ventilation on these levels (31), found that the mean concentration of certain chemicals like ammonia and ethanol was significantly lower in the salons with local exhaust ventilation than in the salons with no ventilation. This demonstrates that it is possible to reduce exposures (31).

Another study from Finland (33) investigated the effect of ventilation and air exchange on the concentration and size of dust particles in the hairdressing salons. They found that the total dust concentration decreased significantly when the air exchange rate increased in the salons. Furthermore, the workers in less ventilated salons complained of discomfort and health problems caused by dust and chemicals more than the workers in the better ventilated salons (33).

1.2.2. Exposure to chemicals in hairdressing products

The most common chemicals found in hairdressing products which may cause adverse health effects are; formaldehyde in shampoos, ammonium compounds in conditioners, ammonium polyvinyl acetate and ethanol in hair sprays, persulphate salts, like sodium persulphate, and potassium in bleaches, ammonium and potassium in dyes and permanent wave preparations, and hydrogen peroxide in emulsions and creams (32). In the bleaching process, an oxidizing agent like ammonium persulphate or hydrogen peroxide is mixed with an alkaline solution like ammonia or potassium (28).

Hairdressers are exposed to these chemicals either by inhalation (through mouth and nose) or by skin contact. In addition, they are also exposed to nickel metal through skin contact when using scissors.

Skin problems are most often caused by glyceryl thioglycolate (GTG), ammonium persulfate or nickel sulfate (34). Respiratory problems are mainly caused by persulphate salts used in hair bleaching products, and considered as the major causal agents of occupational asthma (11). Ethanol in hairsprays has been found to cause bronchoconstriction if inhaled for 30 minutes (35). Additionally, ammonium which is present in permanent hair dyes and permanent wave preparations is reported to be an allergen (31).

1.2.3. Possible adverse health effects among hairdressers

1.2.3.1. Respiratory system problems

The major respiratory problems and symptoms among hairdressers, reported in previous studies are; chronic bronchitis (16;20), rhinitis (16;29;36;37), dyspnoea (16;29), cough and phlegm (16), and in most of the studies the focus has been on occupational asthma (11;12;15;21;22;29;36;38;39).

Most of the studies of occupational asthma and respiratory health problems among hairdressers have been conducted in Europe (12;13;15;16;40;41) and America (42;43), one was in New Zealand (20), and two were in Turkey (21;22). Different observational epidemiological designs have been applied, including cross-sectional (13;16;20;21;29), cohort (15;36;40;44) and case-control (12) study designs.

In a cross-sectional study from Finland (16), the prevalence of chronic bronchitis was 6.8% in hairdressers versus 1.9% in saleswomen. In the same study, odds ratios for selected respiratory symptoms were 1.7 (95 % CI 1.3 to 2.3) for rhinitis in hairdressers compared to saleswomen; 1.9 (95 % CI 1.4 to 2.6) for rhinitis with eye symptoms; 1.4 (95 % CI 1.1 to 1.9) for cough with phlegm; 1.5 (95 % CI 1.0 to 2.2) for dyspnoea; 1.6 (95 % CI 1.0 to 2.7) for dyspnoea with cough, which indicates an association between working in hairdressing and respiratory symptoms.

Hairdressers over 40 years of age were found to have a higher prevalence of several respiratory symptoms than younger hairdressers and office workers of the same age, according to a cross-sectional study from Norway (13). It showed a prevalence of 56% for wheezing in hairdressers versus 24% in office workers, 68% for breathlessness in hairdressers versus 33% in office workers, 33% versus 29% for cough and 50% versus 48% for runny eyes.

The prevalence of occupational asthma among hairdressers in a cross-sectional study from Turkey (21) was 14.6%, which is more than twice that of the general population (21;45). A significant association was found between asthma and high work intensity (OR 3.6, 95% CI 1.2 to 10.9).

Increased incidence rates of respiratory symptoms among hairdressers compared to a control group of the general population was found in a cohort study from Sweden (40). It reported an IR of 9.3 per 1000 person-years for wheeze in hairdressers versus 6.1 in the control group, 9.6 per 1000 person-years versus 7.3 for dry cough and 17.3 versus 11.4 for nasal blockage.
In another study from Sweden (12), the incidence of asthma among hairdressers was 3.9/1000 person-years, with a higher incidence during active years, while the incidence in the reference group of the general population was 3.1/1000 person-years.

In a retrospective cohort study from Finland (15), the relative risk of asthma and chronic bronchitis was almost twice in the hairdressers than in the reference group of shop personnel. The risk of leaving the profession due to asthma and hand eczema was 3.5 times higher for hairdressers as compared to a control group of women engaged in commercial work (18).

In a cross-sectional study, hairdressing apprentices were observed to have a significant deterioration of FEV_1 and $FEF_{25-75\%}$ in comparison with office apprentices (41). The mean value of $\%FEV_1$ dropped from 103.1 to 101.8 for the hairdressers versus 100.0 to 99.8 for the control group. For $\%FEF_{25-75\%}$, the mean value dropped from 100.5 to 97.4 for the hairdressers versus an increase from 95.8 to 98.9 for the control group.

In a study from Turkey, a significantly lower FEV_1 ($p<0.01$) was found among hairdressers (84.6% of the predicted value) as compared to a control group of office workers (93.1% of the predicted value) (22). Furthermore, a case study showed 39% fall in FEV_1 for the subject after bronchial challenge with Potassium Persulphate extract (38).

Some of the previously mentioned studies also showed associations between tasks or exposure and adverse health effects on the workers. The major risk factors for occupational asthma were found to be work intensity and atopy (21). Hair sprays and permanent wave solutions exposure can irritate airways and worsen the symptoms of people with reactive airways or asthma (16;37;46). Moreover, polyvinylpyrrolidone in hair sprays has been suspected of causing alveolitis and lung granulomatosis (thesaurosis) (16;47;48). Repeated hairspray exposure among hairdressers was found to cause pulmonary infiltration due to aerosol thesaurosis (49).

Persulphate salts present in hair bleaches were found to be a main cause of occupational asthma (16;38). During the mixing process of bleaching powder; a fine dust is produced that is readily inhaled by the worker. Four out of 23 staff employed at a hairdressing salon in London (29) developed occupational asthma caused by inhalation of persulphate salts contained in bleach powders. All the workers who had been exposed to persulphate salts in bleaching powder for six months developed symptoms of occupational asthma (29). In a study from Italy, it was reported that half of the hairdressers in the study had occupational asthma and rhinitis, probably due to persulphate salts exposure (36). It has been also reported in a case study from U.S. (43), that hairdressers developed immediate asthmatic symptoms when exposed to henna while mixing it, with a gradually relief when leaving the mixing room (43).

In a study from Norway (31), the concentration of polluting chemicals in hairdressing salons was measured. They reported low concentration of chemicals like ammonia in the salon environment, but it appeared to cause mucosal irritation during bleaching; a task which increases the exposure level (31). A study in Canada found high average of ethanol levels of 40 mg/m³ in salons, compared to 19 mg/m³ in a Norwegian study (31;42) and 11 mg/m³ in a Dutch study (42;50).

1.2.3.2. Skin health problems

Working in hairdressing may also have a negative effect on the skin due to contact with chemicals present in hair products like creams, waxes, gels and dyes and bleaches in some cases (10;14;17;19;34;51;52). In addition, exposure to nickel is the main skin sensitizer agent

among females. It was found that hairdressing is considered as a high risk occupation of exposure to nickel, which might cause hand dermatitis (27).
The most common skin problems are; irritative contact dermatitis and allergic dermatitis.

Dermatitis refers to the inflammation of the skin, principally from exposure to irritants. It may vary from mild irritation to severe inflammation, with large weeping areas and severe swelling. People with a history of skin sensitivities or allergies (for example eczema or asthma sufferers) are more susceptible to dermatitis (32). Dermatitis can be irritant, which is caused by continuous exposure to chemicals (irritative agents) and wet work, and is easily prevented. It can be allergic, which is caused by direct contact with chemicals and thus give an immunologic allergic response. The latter type has usually long term effect and can lead to leaving the profession (32).

In a cross-sectional study in Norway (14), it was reported that 42% of the hairdressers and 23% of the teachers suffered from dermatitis of hands or forearms. In this study, 61% of the hairdressers and 15% of the teachers related these problems to their work (14). In another cross-sectional study of hairdressers and barbers from the U.K. (19), the prevalence of hand dermatitis was 38.6%. It was also reported that the trainee (junior) hairdressers had a higher prevalence of hand dermatitis than the older ones as they usually do most of the washing tasks, and that female respondents had a higher prevalence than males (19).
In a study of drop-outs from hairdressing schools, 26% reported that hand dermatitis was their reason for leaving (34).

A Swedish retrospective cohort study (52), found that hairdressers are more than twice at risk of developing hand eczema compared to a control group from the general population (RR was found to be 2.5). In the same study, the incidence rate of hand eczema in hairdressers older than 25 years was 23.8 cases/1000 person-years, compared with 37.1 cases/1000 persons-years among hairdressers aged less than 25 years (52).
In a cohort study in Germany (53), the incidence rate of hand eczema was 9.7 per 1000 person-years among hairdressers.

Being often wet, because of frequent washing of the hands, hair washing and other tasks (32), makes the skin more susceptible to develop skin problems. This was found in a U.K. study of hairdressers (19), where wet work tasks were significantly associated with the prevalence of hand dermatitis. Additionally, hand eczema is a common problem in occupations that involve

largely manual work, particularly in combination with long periods of exposure to wetness and skin contact with chemicals (17). Moreover, wet unprotected hands are more vulnerable to irritative and allergic agents such as nickel and other chemicals. It was found that nickel allergy is a common problem among women (54). Many hair cosmetic products such as hair dyes, permanent wave solutions and bleaches can cause contact allergy (17).

1.2.3.3. Other health problems: musculoskeletal disorders, cancer and reproductive problems

Musculoskeletal disorders (MSD) especially back pains are among the main health complaints related to working in hairdressing (55). MSD also includes sore feet, back, neck, shoulders, arms, elbows, wrists, hands and fingers (26). It is agreed by salon operators that cutting task is considered to be the main contributor to discomfort, pain and musculoskeletal disorders (26). Also the risk of cancer due to exposure to hair dyes and gels (56), as well as reproductive problems including changes in the menstrual cycles (57) and risk of infertility among female hairdressers (58) have been reported. Cancer, musculoskeletal problems and reproductive problems will not be investigated in the present study.

1.2.4. Hairdressers' knowledge about exposures and adverse health effects

Hairdressers were found to have limited knowledge about the risks of their occupation to their body, especially muscular and skin disorders (26). Additionally, very few hairdressers and trainees know that latex gloves can cause irritant and allergic dermatitis (26).

Most of the hairdressers lack the necessarily knowledge about handling hairstyling and cosmetic products which might lead to improper handling of the chemicals and thus increase the risk of exposure among the workers (26).

A study conducted in the UK (59) to investigate knowledge among hairdressers trainees about the risk of dermatitis during their work, showed that two thirds of trainees were not aware that atopic eczema predisposed to hand dermatitis. Formal pre-school and pre-employment counselling was limited and knowledge on hand care among trainees was often not translated into practice, with gloves being worn by only 9% when shampooing and 58% when perming (59).

1.2.5. Hairdressing in Hebron

Hebron, one of the largest cities in the West Bank, has around 82 female hairdressing salons which are distributed in all the parts of the city. About 70% of these salons are officially registered by the municipality. The registered salons are usually separated workshops with different sizes and numbers of workers, while the non-registered ones are only small rooms in the houses of the owners (25). Most of the salons lack sufficient ventilation, which increases the exposure level, especially during summer, when the temperature becomes high. It is not known if the hairdressers in Hebron are using personal protective equipment like gloves and masks (25).

The hairdressers in Hebron have an association which was established in 1995. It includes all the hairdressers of both genders, who own a hairdressing salon or have been working as a hairdresser for more than two years, in the city and all villages around. The members of the association have weekly meetings in which they discuss different issues related to their work. Their activities include some training and practical workshops for beginners; seminars about the last and new hairstyles that may appear; local and international competitions; making brochures and monitoring activities like visiting selected salons from time to time and checking their conditions; such as sterilization of equipment and cleaning. The number of registered members of the association is 581 (25).

Hebron has several hairdressing training centres in which females and males of different ages and different levels of education can join and learn this profession, both theoretically and practically. These centres provide basic knowledge and practical training in addition to certificates that can be used to officially register as a hairdresser (25).

In a hairdressing salon in Hebron, they perform hair cutting, hair dying, bleaching, permanent waving, straightening, shampooing, rinsing and conditioning. Additionally, different kinds of tasks can be made using waxes, gels, creams and hairspray (25).

It is common in many salons in Hebron, as well as in other Palestinian cities, to have seasonal changes in tasks according to the time, for example, for weddings and some other occasions. In summer time, most of the people have weddings and graduation parties in which they will visit hairdressing salons for styling purposes which mostly includes the use of hairspray for

styling, with less use of dying and bleaching. In winter most of the ladies go for dying and bleaching more than they go for styling (25).

The different kinds of chemicals produced worldwide for industrial, agricultural and other uses include little or no information regarding their safety matters. Developing countries, like Palestine, face major problems associated with toxic chemicals, such as lack of sufficient available scientific information and warning systems and emergency response units for the assessment of risks or handling of chemicals (60).

Palestine is considered to be more often importer more than producer of chemicals. In many times the importers do not submit a Material Safety Data Sheet (MSDS) with each imported chemical. Even if the MSDS is found, it is often not translated into Arabic language. The MSDS should contain information on the hazardous characteristics of the chemical, handling procedures and safe management alternatives (60), that requires training and educational programs which are not found most of the time.

In addition, there is no monitoring system for those chemicals which are imported and distributed in the shops to be handled. Palestine does not have any national safety guidelines for chemicals and hazards compounds and there is no control for importing process. For this reason, one association had developed some projects to implement a controlling system for monitoring and to provide labels in Arabic language for all the chemicals used in hairdressing profession. The main goal of such projects was to increase the awareness among chemical handling in the general populations (60).

There is no specific information available regarding the types of chemicals present in hairdressing products used in Palestine. It is known, from previous studies (14;31;33;39;42;47;51;61;62) that hairdressers are exposed to chemicals by inhalation when using spray and preparing dyes and bleaches, or by skin contact when using creams, waxes and touch of dyes and bleaches. Wet hands during hair wash could also make the skin more sensitive to chemicals.

1.3. Justification of the study

Based on the literature, hairdressers are exposed to chemicals and work tasks which may be harmful to their health. Most of the studies have shown that hairdressers represent a group among working women with a high incidence of both asthma and skin problems. The use of personal protective methods such as gloves and masks varies among them. The ventilation also varies in different hairdressing salons.

The information on the prevalence of respiratory and skin symptoms, among Palestinian hairdressers, caused by reactive chemicals used in hairdressing salons is limited. Most of the studies have been done in Europe and other developed countries. So there is a need for similar studies from developing countries to describe the occurrence and severity of respiratory and skin problems among hairdressers. It was also important to investigate the associated factors.

According to the author's knowledge, there are no previous studies which have investigated adverse health effects among hairdressers in Palestine or in Middle East. Information is also lacking about hairdressers' knowledge of their exposure and potential adverse health effects in their occupation in Palestine. There is also no available information on the exact chemicals they are exposed to. The extent of their exposure and the health disorders they might suffer are unknown. A study on the health situation in the hairdressing salons in Palestine will contribute to increased awareness about occupational health risks in the country.

1.4. Aims and objectives

The aim of the study is to assess respiratory symptoms, respiratory effects and skin health problems among female hairdressers in Hebron City, Palestine.

In order to give answers to the research questions (mentioned in page 14), the following objectives were achieved:
Among 18-50 year old female hairdressers in Hebron, Palestine:

1. To describe work conditions in hairdressing salons including use of personal protective methods (gloves, masks and goggles) and the presence of ventilation (mechanical and windows);
2. To report the chemical ingredients in hairdressing products used in the salons;
3. To estimate the prevalence of respiratory symptoms;
4. To estimate the prevalence of skin problems;

5. To estimate the lung function;
6. To conduct preliminary analyses on the association between exposures at work and respiratory symptoms, skin health problems and lung function by comparing the results between hairdressers working for different duration of time, and between high and low exposed workers (based on intensity of work);
7. To investigate the knowledge of hairdressers about possible adverse health effects of chemicals they are using.

We hypothesized that exposure to chemicals from hairdressing products may cause respiratory and skin problems among female hairdressing workers. These problems would be more prevalent among those with long working days and those who are over exposed to chemicals.

Chapter Two

POPULATION AND METHODS

II. POPULATION AND METHODS

2.1. Research design

We have selected a cross-sectional research design for this study, as it is the only design which measures both the prevalence of health outcomes and exposure, and the association between exposure and health outcomes.

2.2. Population and sample

2.2.1. Population

The number of inhabitants in Hebron district is 551,100, which represent 14.7% of the total Palestinian population in the country (63). The population of this study includes female hairdressers who are currently working in salons in Hebron City. The total number of female hairdressing workers is 406 and they are working in 82 salons in the city.

2.2.2. Sample size

The main idea behind a sample size calculation is to have a high chance of detecting a worthwhile difference between groups, if it exists. This sample should be chosen to be a representative sample for all the hairdressers working in Hebron City.

This study was designed to find the prevalence of different respiratory and skin symptoms and to test the lung function of hairdressers. Furthermore, to compare these symptoms and lung function between different hairdressers according to their exposure level. The power calculation of the sample size was performed to detect an accepted clinical difference in the values of lung function test results between at least two groups of hairdressers which have different levels of exposure or work intensity.

As the lung function data are continuous, a regression test for calculating the sample size was used based on an online calculator (64). Using results from a previous study on farmers in

Palestine (65), the standard deviation of FVC was 0.93, and taking a value of 0.1 as a clinically interesting difference in FVC; alpha of 0.05; and power of 80%. The necessary sample size will be 909.

Prevalence estimates of respiratory symptoms based on studies in Palestine could also be used to calculate the sample size. If we take a prevalence of 13.8% of chronic cough which has previously been found among farmers (65), the sample size may be calculated using the following formula:

$n = z^2pQ/d^2$

While z=1.96, p is the prevalence, Q=1–p and d is the significance level which equals 0.05. Then, the calculated sample size will be 138.

As this study was part of a master program, with limited time and budget, it was not possible to include a large number of subjects. Thus, it was decided to invite 200 subjects.

2.2.3. Inclusion/ exclusion criteria

The following inclusion/ exclusion criteria were considered during sampling process:

Inclusion:
- Female hairdresser;
- Currently working in a hairdressing salon in Hebron;
- Aged 18 – 50 years old.

Exclusion:
- Hairdresser who started working, as a hairdresser for less than one month before sampling;
- Hairdresser who is pregnant at the time of testing.

2.2.4. Sampling method

The Association of Hairdressers in Hebron City was visited in order to obtain a list of all the female hairdressers in the city. However, it was difficult to get a complete list because the association does not include all the workers, but only the ones who have been working for

more than two years or own a hairdressing salon. Another problem is that the list might not be up to date.

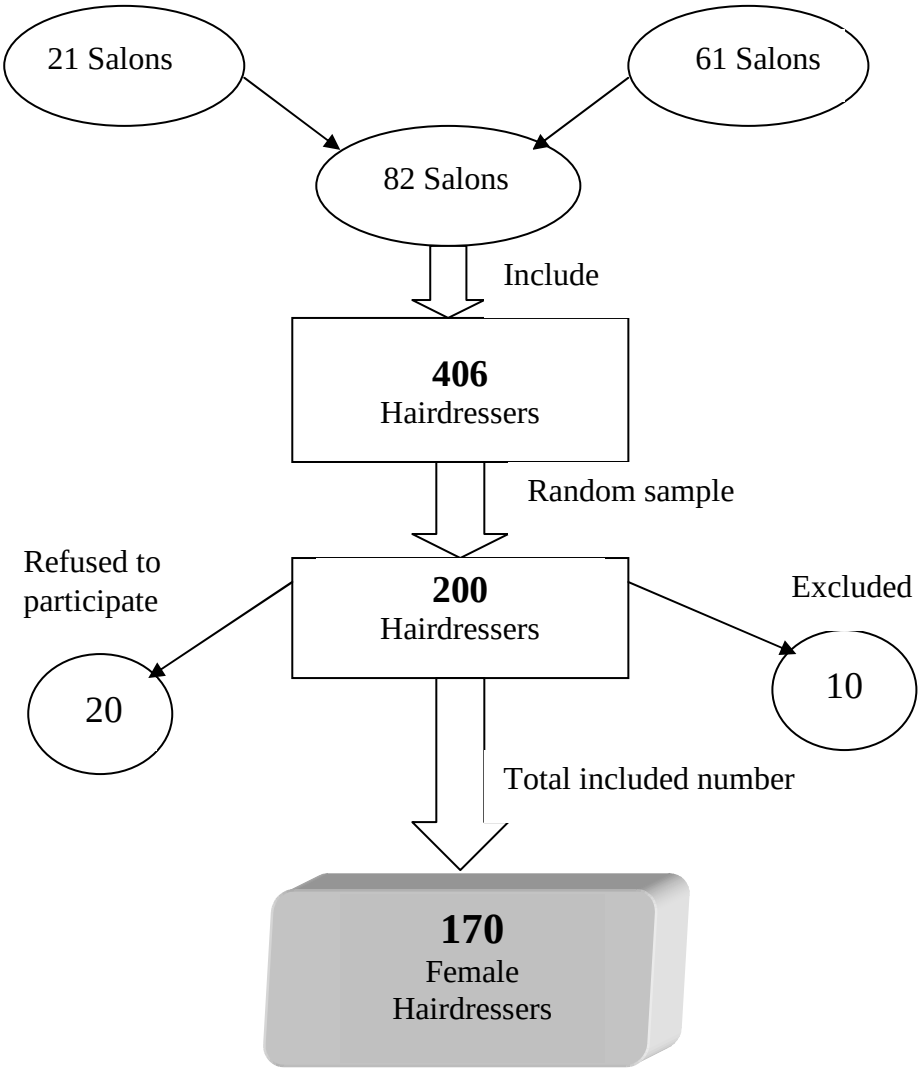
The municipality of Hebron had a register of hairdressing salons, but it was also not updated. It contained no names of hairdressers working in the salons. This made us decide to visit each salon mentioned in the municipality list (21 salons) and other salons physically. As a result, 82 salons were identified and visited. During the visit, we recorded the names of the salons, addresses and their phone numbers and the names of the hairdressers working in each salon so that they could be visited again for data collection. The total number of female hairdressers in the city was 406.

Thereafter each hairdresser from our list was given a number from 1 to 406. A random sample of 200 hairdressers was selected by taking every even number from the list until it reached 200. These 200 hairdressers were visited in their salons with an invitation letter from our research center at Hebron University.

The number of subjects who refused to participate (non participants) was 20 (10%). Three of the participants answered all the questions of the questionnaire, but refused to perform the lung function test because they did not like medical tests. Seven cases were excluded for the following reasons: pregnancy (two); under 18 years of age and working less than one month in this occupation (one); over 50 years of age (two); and smokers (two). We excluded smokers because they were the only smokers among all the participants and we wanted to remove this factor from our comparison, in order to make this sample as homogenous as possible.

In the end, 170 hairdressers, coming from 56 salons, were included in the study to answer the questionnaire and perform the lung function test. The response rate was 87%.

Figure 1. Study Sample



2.3. Research instruments

2.3.1. Questionnaire

We used a modified version of an internationally standardized questionnaire from the American Thoracic Society (66) from which respiratory symptoms questions were taken. Additionally, some questions related to working tasks and exposure were quoted from a study on hairdressers in Norway (61).

The questionnaire also included questions on sociodemographic factors and work history, including intensity of work (hours per day, days per week and number of clients), work tasks and products used, general health status, knowledge about the chemicals use, smoking habits

and use of different protective methods. The questionnaire was filled in by the participants, and if needed, with the help of the fieldworkers in clarifying the questions.

2.3.2. Checklist for working conditions

A checklist form was prepared to record the working conditions in each hairdressing salon. This form aimed at collecting information about the size of the salon, number of workers, presence and type of ventilation, and presence of personal protective methods. Additionally, it aimed to record all kinds of products used in the salon and its chemical contents.

2.3.3. Lung function test (spirometry)

The lung function test aimed at establishing the status of the respiratory system using a Spiro USB (ML2525, Micro Medical Limited, UK), and a disposable mouth piece filter and nose clip during the test. Date of birth, height, weight and smoking habits for each subject were recorded before starting the test.

2.4. Variables

2.4.1. Dependent variables

2.4.1.1. Respiratory health symptoms. These variables were collected by answering yes or no questions in the questionnaire.

We asked about the presence of the following respiratory complaints for the last 12 months (66):
Wheezing in the chest; which is defined as a high-pitched whistling sound during breathing and occurs when the air flows through narrowed breathing tubes (67).
Tightness in the chest the first thing in the morning. Chest tightness is defined as discomfort or pain that you feel anywhere along the front of your body between your neck and upper abdomen (67).
Shortness of breath; during the day, after stopping exercise, and at night. It is defined as a sensation of difficult or uncomfortable breathing, or a feeling of not getting enough air (67).

Coughing; first thing in the morning, and at night.
Bringing up phlegm first thing in the morning.

Additionally, we asked about having the following respiratory symptoms during working hours and during the application of hairspray, dyes and bleaches:
Shortness of breath, tightness in the chest and cough. Besides if they have symptoms from the eye like redness and running, and symptoms from the nose like sneezing, runny and blocked.

All these variables were used in their dichotomized forms in the analyses.

2.4.1.2. *Asthma* is defined as a chronic disease that affects the airways in which the inside walls of them become sore and swollen (2).

It was assessed by questions if she has asthma; when it was diagnosed (childhood or currently); if she had an attack of asthma in the last 12 months; if she is taking any medication for asthma and if it started in the last ten years.

2.4.1.3. Skin health problems. Mainly focused on *hand dermatitis*. Dermatitis is defined as inflammation of the skin, either due to direct contact with an irritating substance, or to an allergic reaction. It includes redness, itching, and in some cases blistering (5).

We included questions about having hand dermatitis, when it was diagnosed by doctor first time and if they believed it was related to the nature of their work. Additionally, the main researcher inspected the hands of the hairdressers to find some common marks of dermatitis especially between the fingers, in the place of holding the scissors and around the nails.

2.4.1.4. Lung function.
Lung function was tested using a PC spirometer (Spiro USB, ML 2525, Micro Medical Limited, UK), by one researcher (the main researcher, Maysa). Measurements were made with the subject sitting in a chair with the back in an upright position and the feet on the floor, and with the nose attached with nose clip, with the mouthpiece in mouth and closed lips around it. The subject breathed steadily three to four times. Then the subject inhaled rapidly and completely, followed by a maximal forced expiration where the subject expired as fast, hard and long as possible. The subject exhaled maximally until no more air could be expelled, at least for six seconds, while maintaining an upright position.

The test included five measurements:

Forced vital capacity (FVC), which measures the amount of air you can exhale with force after you inhale as deeply as possible, expressed in liter (6).

Forced expiratory volume in one second (FEV_1), which measures the amount of air you can exhale with force in one breath at one second, expressed in liter (6).

Peak expiratory flow (PEF), is the maximum expiratory flow achieved from a maximum forced expiration (7). It measures how quickly you can exhale, and measured at the same time with the forced vital capacity, expressed in liter/second (6).

Forced expiratory flow 25 to 75% ($FEF_{25-75\%}$), which measures the air flow in the middle halfway through an exhale (FVC) (6). Also known as the air flow during forced vital capacity manoeuvre measured between 25% & 75% of the obtained FVC (7), expressed in liter/second.

Forced expiratory flow at 75% ($FEF_{75\%}$), which measures the air flow when 75% of the FVC was exhaled (8). Also known as the air flow during forced vital capacity manoeuvre measured at 75% of the obtained FVC (7), expressed in liter/second.

The subjects were given standardised instructions on the forced maximal expiratory manoeuvres, with demonstration of the procedures and repeating them if necessary. Each participant had to practice until she was able to do the test in the correct way.

As a PC spirometer was used for lung function testing, the results of the test appeared in Spida 5 software which is specially designed for spirometry purpose. In each test the participant had to do three acceptable blows (manoeuvres) which appeared on the program as three curves with the resulting numbers for each measurement. The best results of the three flow-volume manoeuvres were selected to be used in the analysis.

Before the selection of the best, all the tests were checked to fulfil the following criteria (7): 1. without an unsatisfactory start of expiration, characterized by excessive hesitation or false start extrapolated volume or EV > 5% of FVC; 2. without coughing during the first second of the manoeuvre, thereby affecting the measured FEV_1 value, or any other cough that, in the

field workers judgment, interferes with the measurement of accurate results; 3. without early termination of expiration; 4. without a hesitation during the manoeuvre that causes a cessation of airflow, which precludes accurate measurement of FEV_1 or FVC, 5. without a leak, 6. without an obstructed mouthpiece (e.g. obstruction due to the tongue being placed in front of the mouthpiece, or teeth in front of the mouthpiece); 7. without evidence of an extra breath being taken during the manoeuvre.

The acceptable curves were determined after meeting all the seven conditions mentioned above. According to these criteria, 25 hairdressers were found to have some unfulfilled conditions and were visited again to repeat the test and we made sure that their tests were acceptable.

Then, the best values for each of FVC, FEV_1, PEF, $FEF_{25-75\%}$ and $FEF_{75\%}$ were selected according to ATS criteria (7), which says that "the largest FVC and the largest FEV_1 should be recorded after examining the data from all of the usable curves, even if they do not come from the same curve."

The selected measurements then were entered on SPSS with the other information collected from the questionnaires and were used in the analyses in a continuous scale.

2.4.2. Independent variables

2.4.2.1. Sociodemographic variables

Age was filled by the subject in years. It was then categorized into three groups; 18 – 23 years, 24 – 31 years and 32 – 50 years old.

Marital status had three options in the questionnaire: single; married; and was married. The variable was operationalized into two categories; single (including was married) and married.

Level of education was collected by asking about the total years of education. The variable was then categorized into three levels according to the educational system in Palestine, which are; primary education (1 – 10 years), secondary education (11 – 12 years) and university or high education (more that 12 years).

Residential area was measured from three options: city; village; and camp. Nobody of the subjects lived in a camp, so we kept the two other categories.

Height was measured in centimetres for each case before the lung function test.

Weight was measured in kilograms for each case before the lung function test.

Body Mass Index (BMI) was calculated from height and weight. It equals to the weight in kilograms (kg) divided by the height in meters (m) squared. Then it was categorized into four groups; underweight (< 18.5), normal weight (18.5 – 24.9), over weight (25 – 29.9) and obese (> 30).

Smoking was assessed by asking a number of questions related to whether the subject is smoking currently, if she quit and how many cigarettes she smoked daily. In the analyses, this variable was excluded as only two of the subjects were smokers and those two individuals were excluded.

2.4.2.2. Exposure variables

Duration of work in hairdressing was assessed by asking the question, "how many years have you been working in hairdressing?" The variable was then categorized into three groups: < 2 years; 2 – 5 years; and 6 years and more.

Working days per week was assessed by asking the question "how many days a week do you work in a hairdressing salon?" The variable was categorized into three groups: 2 – 5 days; 6 days; and 7 days.

Working hours per day was assessed by asking the question "how many hours a day do you work in a hairdressing salon?" The variable was categorized into three groups: 2 – 5 hours; 6 – 7 hours; and 8 – 10 hours per day.

Number of clients per week was categorized into three groups: 3 – 15 clients; 16 – 30 clients; and more that 30 clients per week.

The most frequent tasks they did. A list of the different tasks that are usually done in the hairdressing salons was provided, and the subjects were asked to choose the ones they did most frequently. The list contained cutting, dying, bleaching, straightening, permanent waving and others like styling and finishing.

The most frequent products they used: a list of the cosmetic products that are usually used in the hairdressing salons was provided, and they were asked to choose the products that had been used most frequently. It included shampoo, conditioner, hairspray, hair dyes, bleaching powder, henna, permanent wave solutions, straightening creams and others like creams and waxes.

Frequency of applying risk tasks, tasks that included extensive chemical exposure, was assessed by asking about the number of times per week of applying dying, bleaching, waving and straightening.

A bleaching score variable was prepared by combining the number of working years, the number of days per week, the number of hours per day and the number of bleaching times per week. This variable was used as a basic exposure indicator.
A dying score variable was prepared by combining the number of working years, the number of days per week, the number of hours per day and the number of dying times per week. This variable was used as another exposure indicator.
Use of personal protective equipment (PPE) was assessed by asking if they were using any PPE. They were also asked to specify the type they were using; gloves (plastic or rubber), nose cover or mask and goggles.

2.4.2.3. Knowledge variables
Different "yes / no" questions were asked about knowledge, including:
If she *reads the chemical ingredients* and instruction of use on the products; if she *knows about the potential hazardous effect of these chemicals*; if she *thinks that the health problem she has is related to her work*; and if she *thinks that having hand dermatitis is related to wet work and contact with chemicals*.

2.5. Data collection procedure and practical experience in the field

2.5.1. Selection and training of research assistants

As the study involved a questionnaire, spirometry and checklist for each salon, at least one research assistant was needed to help the main researcher in data collection. It was preferred to have a female research assistant because the participants were all females. The assistant had experience with similar research projects in which lung function was tested, and had good communication skills. In the middle of data collection period, and after we collected data from half of the participants, the assistant had to stop working because of giving birth to a baby. So, a new research assistant was included who was also trained on the nature of this work. She continued until the end of the study.

2.5.2. Pre-testing (piloting)

The pre-test of the present study served the purpose of identifying potential problems and examined the logic of the testing procedure and applicability.

As for the questionnaire, it was pre-tested by giving it to a small number of people from the general population and some hairdressers with different levels of education; to find out if the questions were clear and if they understood each question in the same way that it was meant to by the researcher, i.e. if the questions were valid. This process was important to ascertain the suitability of the questions in local cultural settings and to minimize the possibility of evoking undue responses or asking question that may have a different meaning to the local population. During the pre-testing, we felt that some questions did not add any useful information and were therefore removed or edited. The questionnaire was translated from English to Arabic and translated back to English by another person who was not part of the research to check the internal validity of the questions and to make sure that it did not lose the meaning during the translation process.

2.5.3. Fieldwork

2.5.3.1. Planning

The total fieldwork period was between the middle of August and the end of November 2008. The head of Association of hairdressers in Hebron was visited before starting data collection and shown a letter from Hebron University which explained the aims and a description of the study. We received a permission to conduct the study among the members. During that time, new mouth pieces for the spirometer were ordered from an abroad company via a local one, and the spirometer which was available in advance was checked.

The questionnaire was approved in Norway before leaving for fieldwork, but it had to be translated from English into Arabic by the researcher with the help of a language teacher at the university. Additionally, all the invitation letters and consent forms were also translated into Arabic to be sent to the participants when inviting them.

2.5.3.2. Contact with the subjects

When the sample was ready, the hairdressers were visited in their salons. In the first visit, the aim and content of the study were described for them. They were asked to give their consent if

they would like to participate in the study by signing on the consent form. They were allowed to ask any further questions about the study if they had any.

2.5.3.3. Data collection

The subjects who agreed to participate were given an appointment to visit them again for collecting the required data. The ones who had time for data collection during the first visit were given the questionnaires to answer immediately, while the others were given a new appointment.

It was important that the lung function test was performed for all the participants at the same season because it is affected by the weather. It was also preferred to do it at the same period of time during the day, e.g. either doing it in the morning or the late afternoon for all, as the results of spirometry differ from mornings to noons. All these were taken into consideration when the meetings with the subjects were scheduled. Most of the time, the visits were in the mornings when the questionnaires and the tests were performed at the same meeting. However, in some cases the same hairdresser was visited in the afternoon to fill the questionnaire and visited another time in the morning to perform the test.

Since many of the hairdressers had low education, the research assistant was available to read and explain any unclear questions.

For the checklist, the main researcher filled in the situation in each salon and asked the owners about presence of personal protective equipment. In addition, all the products that were used in the salon were checked and their chemical ingredients were recorded.

Data was entered to SPSS (version 16.0) during and after the data collection phases, and re-checked for possible errors in the entry.

2.5.3.4. Limitations and problems during fieldwork

Some problems happened which made slight changes in the plans. First, the data collection was delayed. It was originally planned to be done within two months when the weather is warm and before the end of November when winter usually starts in Palestine. As the fieldwork was done in a Muslim country, the fasting month in 2008 (Ramadan) was during

September. In this month, it was not possible to perform the lung function test because it would have been affected by fasting when performing it. So it was only possible to start testing after Ramadan. Additionally, some mouth pieces for the spirometer were available from previous studies, but they were not sufficient in number, so new ones were ordered and were supposed to be ready by August. However, for transporting reasons they were delayed and not received until the middle of October. At that time, the work was supposed to be started quickly to make sure that all data collection would be done before the winter started.

Several times during fieldwork, the spirometer totally stopped functioning, which made us have to repeat the test or manoeuvres several times. We had long fieldwork period because of time limitations of the lung function test (only one period during the day for all the participants). We could not get the whole list of the officially registered hairdressers and their salons in the city from the Government or the Association of hairdressers in Hebron, thus, we needed some more time to get the list manually. The instrument was damaged after finishing 40 cases of hairdressers; a new one was ordered from abroad which caused more delay we had to find and train a new research assistant after the first one had delivered, this happened in the middle of the data collection period. This was because the first one had two month pre-term delivery which was not expected, so we did not plan to have another assistant.

2.6. Statistical methods

The Statistical Package for Social Sciences (SPSS version 16.0) was used for data entry and for statistical analyses. Descriptive data was presented with means and corresponding standard deviations (SD) and/or 95% confidence interval (CI). One-way ANOVA was used for continuous outcome (lung function measurements). Chi-square ($\chi 2$) tests were applied for comparing differences in categorical variables. General linear model (ANCOVA) was used for comparing differences in lung function among hairdressers of different exposure levels. Binary logistic regression was used for dichotomous outcome variables to compare them among hairdressers of different exposure levels.

An exposure score for the two most important risk tasks (bleaching and dying) was prepared by combining several variables related to intensity of work and frequency of these work tasks. The aim of making these scores is to categorize the subjects into different groups according to the level of intensity of exposure. These scores were used for the outcomes: lung function test

results and self-reported respiratory and skin problems. Level of statistical significance was set to $p \leq 0.05$, or 95% confidence interval. For the purpose of investigating the association between exposure and outcome, we present crude data, only.

2.7. Ethical considerations

Ethical application was submitted to the Norwegian regional ethical committee, and the clearance was obtained. As there is no ethical committee in Palestine yet, the research protocol was sent to the Ministry of Health in Palestine for approval. Furthermore, a letter describing the purposes and procedures of the study was sent to the Association of hairdressers in Hebron city to get the permission to contact the members. As this study was a part of a joint project between the University of Oslo and Hebron University, the study protocol was submitted to both universities and approved before starting the fieldwork.

The subjects voluntarily participated in the study, and a written informed consent was obtained from every hairdresser. The invitees were given an invitation letter and informed consent form. In this invitation, there were information about the study, its purpose and how it was going to be done. They were also informed that the participation is voluntary and they can refuse or terminate their participation any time they want without giving the reason for that. At the end they had to sign if they would like to participate.

As the study sample contained hairdressers of different educational levels, we made sure that everyone completely understood what was written in the invitation. For the ones who were not educated at all, the researcher read all the information, explained it to them and got their oral consent and signature when possible.

All information about subjects was handled confidentially. No names or specific identifying marks were registered. A five-digit code was used to identify each participant, where the first two digits represented the number of the hairdressing salon and the rest three ones represented the number of the hairdresser.

We did everything possible to protect the participants from any potential harm that could happen because of participation. Hairdressers that had some positive results in the test were

advised to visit a doctor, and all participants will obtain safety guidelines related to the use of chemicals in hairdressing salons. The guidelines will be made by both the research team and the Association of hairdressers in Hebron, and will be delivered to all the hairdressers in the city.

The potential risks that may appear in the present study are mostly related to discomfort because of doing the lung function test and talking about the health problems of the participants if they had any. This was dealt with by giving every participant enough time to practice the test and perform it as required, and ensuring them that all their information will be handled confidentially so that they felt more comfortable.

Chapter Three

RESULTS

III. RESULTS

3.1. General characteristics of the study sample

The sample included 170 female hairdressers with a mean age of 28 years, ranging from 18 to 50 years. More than half (66.5%) were not married and most of them live in Hebron City (90.6%). A little more than half (59%) had completed secondary education, while only 13.5% had tertiary education. The mean height was 161 cm, with a range of 145 to179 cm, and the mean weight was 60 kg, with a range of 40 to 95 kg. According to BMI levels, 58% were within the normal weight, only 4% were underweight, 29% were overweight and 8.8% were obese (Table 1).

Table 1. General characteristics of the sample (N=170)

Characteristics		Number and/or mean and range	Percent
Age			
	18 – 23 years	65	38.2
	24 – 31 years	50	29.4
	≥ 32 years	55	32.4
	Mean years (SD[1])	28 (7.6)	
	Range	18 – 50	
Marital status			
	Single	113	66.5
	Married	57	33.5
Residential area			
	City	154	90.6
	Village	16	9.4
Education level			
	Low (1-10 years)	46	27.1
	Medium(11-12 years)	101	59.4
	High (>12 years)	23	13.5
	Mean years (SD[1])	11 (1.9)	
	Range	2 – 16	
Height (cm)			
	Mean (SD[1])	161 (6.4)	
	Range	145 – 179	
Weight (kg)			
	Mean (SD[1])	60 (11.1)	
	Range	40 – 95	
Body Mass Index			
	Underweight	7	4.1
	Normal weight	99	58.2
	Overweight	49	28.9
	Obese	15	8.8
	Mean (SD[1])	24.2 (3.9)	
	Range	16.9 – 36.6	

[1] Standard Deviation

3.2. Description of work environment

Fifty six hairdressing salons were visited in Hebron City. Their sizes ranged from 3 m² to 60 m², with a mean of 20 m² (SD 12.6). The mean number of workers was 5 (SD 3.6), ranging from one to 18 workers. Altogether 43 (77%) salons had a ventilation method while only 13 (23%) salons had no ventilation at all. The ventilation method included windows (84%), air conditionings (14%) and small openings (2%). The mean size of the windows in the salons was 1.2 m² (SD 1.1), and ranged between 0.1 to 4 m². Thirty three (59%) of the salons had only one window as a place of ventilation, while 10 salons (18%) had two windows. Different protective methods were present in 45 salons (80%), 36 (64%) had latex gloves available, while 9 salons (16%) had plastic gloves. Only four salons (7%) had masks or nose covers in addition to the plastic gloves.

3.3. Work history and exposure

3.3.1. Intensity of work

The mean number of years of working in hairdressing was around 5 years, with a mean of 6 hours per day and almost 6 days per week, and a mean number of 25 clients per week (Table 2).

Table 2. Work intensity

Variable		Number	Percent	Mean (SD[1])
Number of working years in hairdressing				5.4 (5.7)
	0.1 – 2 years	55	32.4	
	2 – 5 years	56	32.9	
	≥ 6 years	59	34.7	
Number of working hours per day				6.4 (1.9)
	2 – 5 hours	44	25.9	
	6 – 7 hours	77	45.3	
	8 – 10 hours	49	28.8	
Number of working days per week				5.9 (1.2)
	2 – 5 days	36	21.2	
	6 days	65	38.2	
	7 days	69	40.6	
Number of clients per week				25 (15.1)
	3 – 15 clients	60	35.3	
	16 – 30 clients	68	40	
	≥ 31 clients	42	24.7	

[1] Standard Deviation

3.3.2. Frequency of tasks performed by the hairdressers

According to the informal talks held with the hairdressers, most of the juniors or beginners do the washing and conditioning after applying dyes and bleaches, while the seniors do more of the cutting and styling in addition to preparing the mix of the dyes and bleaches. Fourteen percent of the hairdressers did cutting as the most frequent task, while 37% were dying the hair most of the time and 7% were bleaching most of the time. Thirty-nine percent were mostly doing the styling and finishing and 3% were cutting, dying and bleaching most of the time (Table 3).

Table 3. Most frequent tasks done by the hairdressers

Task	Number	Percent
Cutting	24	14
Dying	62	36.5
Bleaching	12	7.1
Straightening	1	0.6
Styling and finishing (spraying)	66	39
Cutting, dying and bleaching	5	3

Among the tasks which included dealing with chemicals, we found a mean of 7 times a week of bleaching, 13 times a week of dying, once a week of straitening and less than once (0.4) a week of permanent waving (Table 4). However, some of the hairdressers had up to 70 times a week of dying or bleaching.

Table 4. Number of times per week of doing certain tasks by the hairdressers

Task	Min	Max	Mean(SD[1])
Bleaching	0	70	7.2(12.9)
Dying	0	70	12.6(14.3)
Permanent waving	0	28	0.4(2.4)
Straitening	0	24	0.9(2.7)

[1] Standard Deviation

3.3.3. Use of products by the hairdressers

Hairspray and hair dyes were the most frequently used products by 39% and 31% of the hairdressers, respectively. About 19% were using creams and waxes most of the time, 10 (6%) were using shampoo and conditioner most frequently and 8 (5%) were using bleaching powder most frequently (Table 5).

Table 5. Most frequently used products by the hairdressers

Products	Number	Percent
Shampoo and conditioner	10	5.8
Hairspray	67	39.4
Hair dyes	52	30.6
Henna	1	0.6
Bleaching powder	8	4.6
Creams and waxes	32	18.8

3.4. Use of personal protective equipment

Ninety two percent of hairdressers were using gloves during their work, 69% were using rubber gloves and the rest (22%) were using plastic gloves. They reported (from informal talks) that they used gloves sometimes when applying dyes and bleaches but not when washing the hair. Very few were using nose covers or masks (11%) and goggles (2%) (Table 6).

Table 6. Using personal protective equipment during application of dyes and bleaches

Method	Number	Percent
Gloves	156	91.8
Plastic (PVC)	38	22.4
Rubber (latex)	118	69.4
Nose cover/mask	19	11.2
Goggles	3	1.8

3.5. Chemicals used in the salons

The chemical ingredients of each hairdressing product in the salons are described in Table 7.

Table 7. List of chemicals in hairdressing products used in the salons with a potential adverse effect on health

Products	Chemical ingredients
Shampoo	Sodium Laureth Sulfate
	Glycol Distearate
	Sodium Chloride
	Citric Acid
Conditioner	Cetrimonium Chloride
	Cocoamido Propylbetaine
	Dihydrochloride
Hairspray	SD alcohol
	Butane
	Methyllel Propane
	Hydroflourocarbon
	Copolymer
Hair dye (permanent hair colour)	Cetearyl alcohol
	Ammonium Hydroxide
	Stearic Acid
	Palmitic Acid
	Sodium Hydrosulfite
Bleaching powder	Ammonium Persulfate
	Magnesium Carbonate
	Sodium Lauryl Sulfate
	Potassium Persulfate
Oxygen cream	Hydrogen Peroxide
	Cetyl Alcohol
	Lanoline
	Sodium Lauryl Sulfate
	Phosphoric Acid
Straightening cream (relaxer)	Ammonium Thioglycolicate
	Sodium Hydroxide
	Sodium Sulfate
	Glycerine
Styling gel and mousse	Ethanol
	Aminomethyl Propanol
	Dimethylaminoethylmethacrylate Copolymer

3.6. Hairdressers' knowledge of exposure to chemicals and their adverse health effects

The hairdressers were asked if they had checked the ingredients written on the products they were using, and if they knew anything about these chemicals. Around 78% reported that they usually read the ingredients, while about 29% reported that they knew a bit about them. They were asked if they were having any health problems, and they were asked if they thought the problem was related to their work. Twenty seven percent reported having a health problem and 54% reported that they thought it was related to their work and exposure. Regarding hand dermatitis, which was reported in 14% (Table 8), 74% of those who reported to have hand dermatitis said they knew it was related to their exposure to wetness and contact with chemicals.

3.7. General health status and history of disease

Table 8 shows the frequency of doctor-diagnosed health problems. The most common health problems were: rhinitis (27%); eye or nasal allergy (35%) and hand eczema (14%).

Table 8. Diseases diagnosed by a doctor

Disease	Number	Percent
Pneumonia	5	2.9
Bronchitis	10	5.9
COPD[1]	3	1.8
Asthma	9	5.3
Lung fibrosis	1	0.6
Rhinitis	45	26.5
Eye or nasal allergy	59	34.7
Hand dermatitis	23	13.5
Heart disease	2	1.2

[1] Chronic obstructive pulmonary diseases

Nineteen percent reported current use of medication; 10% were using tablets (type was not specified), 3% were using eye or nose drops, 3% were using prescribed creams, 2% were using asthma spray and 1% were using allergy drops (not mentioned in the table).

Table 9. Current use of medications

Form of medication	Number	Percent
Any medication	33	19.4
Tablets	17	10
Eye or nose drops	5	2.9
Cream prescribed by a doctor	5	2.9
Asthma spray	3	1.8

3.8. Respiratory symptoms

Symptoms from the respiratory system are presented in Table 10. Nineteen percent reported wheezing; 31% reported tightness in the chest; 25% reported shortness of breath; 17% reported coughing in the morning and 22% reported having phlegm. Seventy two percent reported never or rarely having trouble with their breathing, while 27% reported regular trouble which disappears and 2% reported that their breathing is never quite right. When asked about being next to dusty places or animals, 47% reported feeling tightness in the chest and 59% reported having shortness of breath.

Table 10. Frequency of respiratory health symptoms among the hairdressers

Symptom	Number	Percent
Wheezing or whistling in the chest, in the last 12 months	32	18.8
Tightness in the chest first thing in the morning, in the last 12 months	53	31.2
Attack of shortness of breath during the day, in the last 12 months	42	24.7
Attack of shortness of breath after stop exercise, in the last 12 months	79	46.5
Woken at night by attack of shortness of breath, in the last 12 months	41	24.1
Woken at night by attack of coughing, in the last 12 months	48	28.2
Cough first thing in the morning	29	17.1
Bring up phlegm from the chest first thing in the morning	37	21.8
Bring up phlegm from chest in the morning for at least 3 months each year	33	19.4
Never or rarely get trouble with the breathing	122	71.8
Get regular trouble with the breathing, but it always gets completely better	45	26.5
Breathing is never quite right	3	1.8
Get feeling of tightness in the chest, when present in dusty part or with animals or near feathers	80	47.1
Start to feel short of breath, when present in dusty part or with animals or near feathers	101	59.4

Table 11 reports the frequency of respiratory symptoms during working hours and work tasks. Shortness of breath was most frequent during application of hair spray (31%). In addition, cough and tightness of the chest were also most frequent during spray application (13% and 23%, respectively). Eye symptoms and nose symptoms were most frequent during bleach preparation (39% and 27%, respectively).

Table 11. Respiratory symptoms during working hours and work tasks

Symptom \ Task	During working hours		Application of hair spray		Preparation of dye		Preparation of bleach	
	No.	%	No.	%	No.	%	No.	%
Shortness of breath	35	20.6	53	31.2	48	28.2	49	28.8
Cough	20	11.8	22	12.9	19	11.2	19	11.2
Tightness in the chest	29	17.1	39	22.9	32	18.8	34	20
Symptoms from the eyes (running)	38	22.4	36	21.2	63	37.1	67	39.4
Symptoms from the nose (sneezing, runny or blocked)	37	21.8	45	26.5	48	28.2	46	27.1

The prevalence of doctor's diagnosed asthma was 5.9% (Table 12). Only one percent reported childhood asthma, 3% reported adult asthma and 2% reported current asthma. Four percent reported that asthma started during the last 10 years. Four percent had had an asthma attack in the last 12 months, and 3% were taking asthma medication during the study (Table 3.12).

Table 12. Prevalence of asthma among the hairdressers

Question	Number	Percent
Ever had asthma (doctor diagnosed)	10	5.9
Childhood asthma	1	0.6
Adult asthma	5	2.6
Current asthma	4	2.4
Had an attack of asthma at any time in the last12 months	6	3.5
Currently taking any medicines for asthma	5	2.9
Did the asthma start during the last 10 years	7	4.1

3.9. Skin problems

The prevalence of hand dermatitis was 13.5%, and 74% of those with hand dermatitis believed it was related to their nature of work. Twenty four percent of the hairdressers reported to never wearing earrings which could give some indication of the prevalence of nickel allergy. Those who had hand dermatitis, when asked about its duration, they reported the mean number of 5.5 years ago, with a maximum of 18 years ago.

3.10. Association between exposure and health symptoms

Preliminary analyses of the association between work intensity, and respiratory and skin health symptoms (Table 13) indicate a significant association between working years in hairdressing and wheezing ($p=0.01$), tightness in the chest ($p=0.01$) and phlegm ($p=0.02$). Age was significantly associated with wheezing, tightness of chest, shortness of breath and asthma.

Table 14 shows selected respiratory symptoms for two groups of hairdressers with different levels of exposure. It shows that the group of hairdressers who had a higher number of times of using dyes had significantly more self-reported wheezing and tightness in the chest than the ones with lower number of times of using dyes. On the other hand, the group with high bleaching times have significantly more self-reported shortness of breath. Multivariate analyses controlling for age will be performed as a part of the future PHD study.

Table 13. Health symptoms among the hairdressers sample for different variables (Total N=170) (Chi square test)

Variables \ Symptoms			Wheezing or whistling in the chest, in the last 12 months (n=32)		Tightness in chest in the morning, in the last 12 months (n=53)		Attack of shortness of breath, in the last 12 months (n=42)		Woken at night by attack of coughing, in the last 12 months (n=48)		Bring up phlegm from the chest in the morning (n=37)		Having asthma (n=10)		Having hand dermatitis (n=23)	
			N (%)	P value	N (%)	P value	N (%)	P value	N (%)	P value	N (%)	P value	N (%)	P value	N (%)	P value
Age	18–23yrs	(n=65)	5 (16)		12 (23)		7 (17)		13 (27)		9 (24)		1 (10)		6 (26)	
	24–31yrs	(n=50)	9 (28)	0.02	14 (26)	0.01	18 (43)	0.003	15 (31)	0.132	11 (30)	0.078	2 (20)	0.027	7 (30)	0.358
	≥32 yrs	(n=55)	18 (56)		27 (51)		17 (41)		20 (42)		17 (46)		7 (70)		10 (44)	
Years of work in hairdressing	0.1–2yrs	(n=55)	5 (16)		12 (23)		11 (26)		14 (29)		12 (32)		1 (10)		6 (26)	
	2–5 yrs	(n=56)	7 (22)	0.01	14 (26)	0.01	11 (26)	0.128	14 (29)	0.488	6 (16)	0.02	4 (40)	0.284	8 (35)	0.779
	≥ 6 yrs	(n=59)	20 (63)		27 (51)		20 (48)		20 (42)		19 (51)		5 (50)		9 (39)	
Hours of work per day	2 – 5 hrs	(n=44)	3 (9)		11 (21)		7 (17)		14 (29)		10 (27)		0 (0)		3 (13)	
	6 – 7 hrs	(n=77)	14 (44)	0.013	25 (47)	0.57	22 (52)	0.281	19 (40)	0.639	15 (41)	0.789	3 (30)	0.008	7 (30)	0.007
	8–10 hrs	(n=49)	15 (47)		17 (32)		13 (31)		15 (31)		12 (32)		7 (70)		13 (57)	
Days of work per week	2–5days	(n=36)	3 (9)		12 (23)		10 (24)		13 (27)		11 (11)		2 (20)		2 (9)	
	6 days	(n=65)	10 (31)	0.038	15 (28)	0.18	16 (38)	0.874	16 (33)	0.463	11 (30)	0.282	3 (30)	0.808	11 (48)	0.266
	7 days	(n=69)	19 (59)		26 (49)		16 (38)		19 (40)		15 (41)		5 (50)		10 (44)	
Times of bleaching per week	0–1 tms	(n=72)	13 (41)		22 (42)		12 (29)		21 (44)		14 (38)		4 (40)		11 (48)	
	2–5 tms	(n=47)	9 (28)	0.98	14 (26)	0.92	16 (38)	0.086	14 (29)	0.871	13 (35)	0.515	3 (30)	0.983	4 (17)	0.496
	6–70tms	(n=51)	10 (31)		17 (32)		14 (33)		13 (27)		10 (27)		3 (30)		8 (35)	
Times of dying per week	0–3 tms	(n=63)	9 (28)		16 (30)		14 (33)		14 (29)		18 (49)		1 (10)		5 (22)	
	4–15tms	(n=57)	11 (34)	0.42	19 (36)	0.44	14 (33)	0.778	18 (38)	0.409	9 (24)	0.223	5 (50)	0.186	7 (30)	0.09
	16–70tms	(n=50)	12 (38)		18 (34)		14 (33)		16 (33)		10 (27)		4 (40)		11 (48)	
Number of clients per week	3–15clnts	(n=60)	6 (19)		16 (30)		9 (21)		14 (29)		17 (46)		2 (20)		7 (30)	
	16–30clnts	(n=68)	11 (34)	0.04	22 (42)	0.602	18 (43)	0.053	18 (38)	0.243	12 (32)	0.304	3 (30)	0.156	6 (26)	0.072
	31–100clnts	(n=42)	15 (47)		15 (28)		15 (36)		16 (33)		8 (22)		5 (50)		10 (44)	

Table 14. The association between intensity of exposure and selected respiratory symptoms (Total N=170) (Binary logistic regression)

Exposure \ Symptoms		Wheezing or whistling in the chest, in the last 12 months (n=32)				Tightness in the chest first thing in the morning, in the last 12 months (n=53)				Attack of shortness of breath during the day, in the last 12 months (n=42)			
		N (%)	OR*	95% CI	P	N (%)	OR*	95% CI	P	N (%)	OR*	95% CI	P
Bleaching score	Low (n=84)	12(37.5)	Ref.		0.138	25(47.2)	Ref.		0.69	15(35.7)	Ref.		0.043
	High (n=86)	20(62.5)	1.82	0.83 – 4.01		28(52.8)	1.14	0.59 – 2.18		27(64.3)	2.11	1.02 – 4.33	
Dying score	Low (n=87)	11(34.4)	Ref.		0.038	20(37.7)	Ref.		0.019	16(38.1)	Ref.		0.053
	High (n=83)	21(65.6)	2.34	1.05 – 5.22		33(62.3)	2.21	1.14 – 4.30		26(61.9)	2.02	0.99 – 4.13	

* crude estimates

Figure 2. Frequency of selected health symptoms and diseases in different age groups of the hairdressers

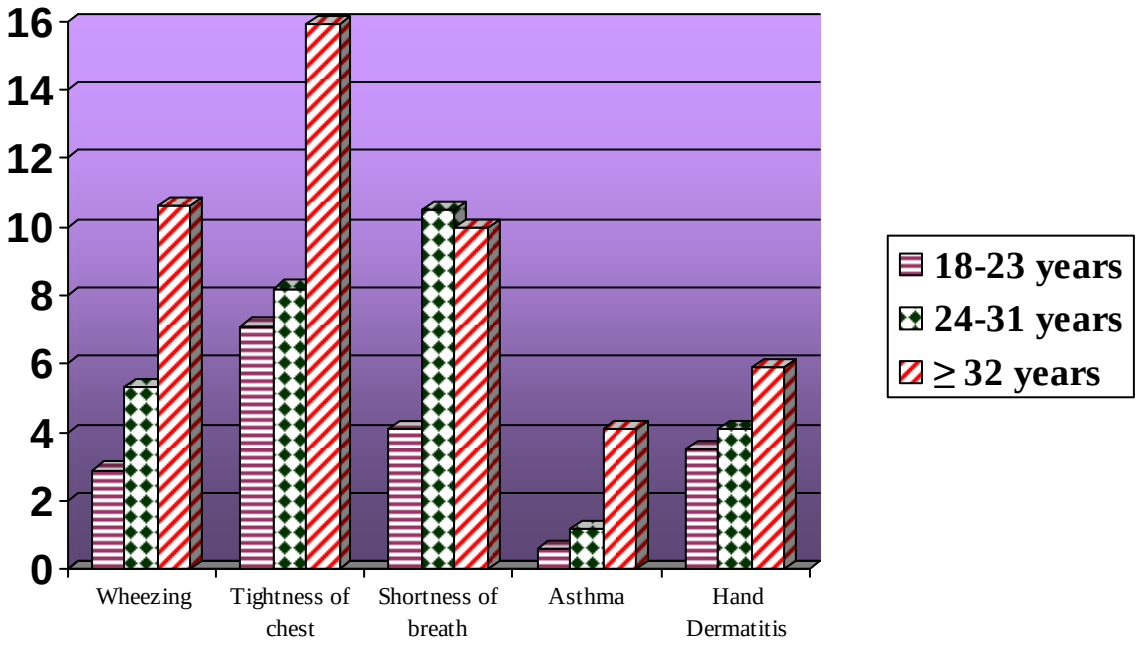


Figure 3. Frequency of selected respiratory symptoms for two groups of hairdressers according to chemical exposure by bleaching level

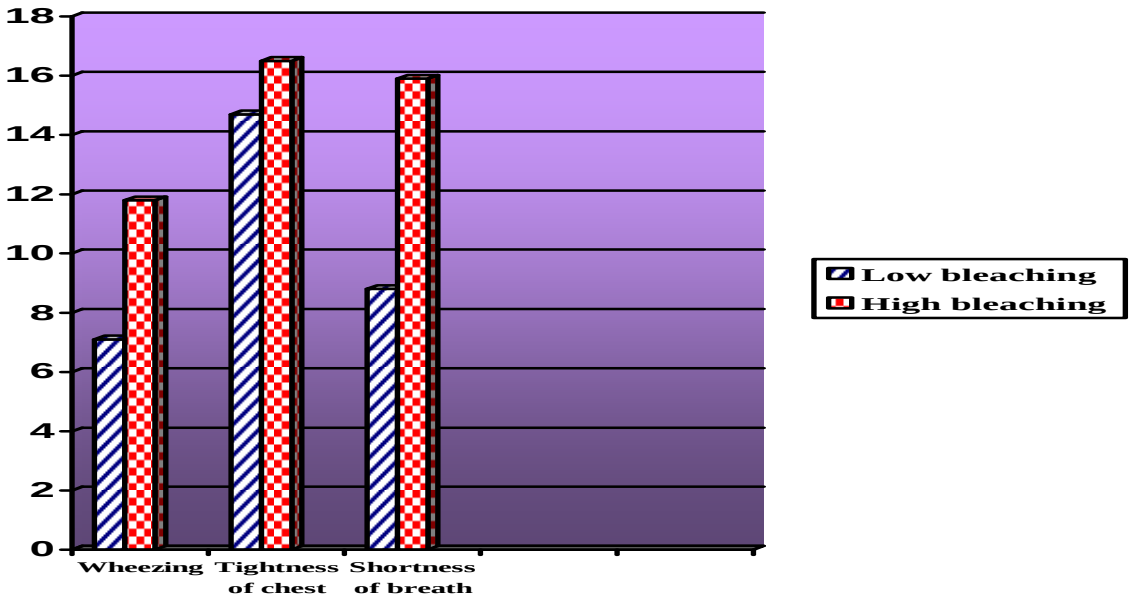
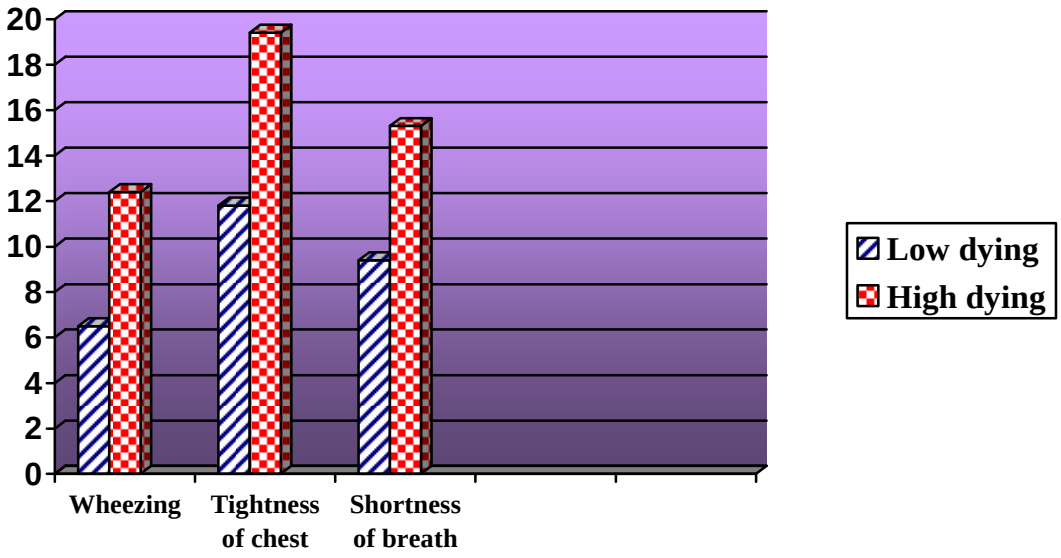


Figure 4. Frequency of selected respiratory symptoms for two groups of hairdressers according to chemical exposure by dying level



3.11. Lung function test

Table 15 shows the lung function measurements for the sample of hairdressers. The mean FVC was 3.31 liters (SD=0.44) which was 96.5% of predicted value as compared to European standards. For FEV_1, the mean value was 2.74 liters (SD=0.60) which was 92.4% of predicted value as compared to European standards.

Table 15. Lung function measurements and predicted values among female hairdressers in Hebron City (N=170)

	Measured		**Predicted**		**Percent of predicted**	
	Mean (SD)	*Range*	*Mean (SD)*	*Range*	*Mean*	*(95% CI)*
FVC (l)	3.31 (0.44)	1.96 – 5.06	3.43 (0.32)	2.57 – 4.21	96.49%	(93.9 – 99.0)
FEV_1 (l)	2.74 (0.60)	1.24 – 3.94	2.99 (0.30)	2.20 – 3.94	92.35%	(90.26 – 94.44)
PEF (l /s)	5.61 (1.16)	2.44 – 8.25	6.79 (0.54)	3.49 – 8.97	82.65%	(80.05 – 85.26)
$FEF_{25-75\%}$ (l /s)	3.03 (0.97)	0.23 – 5.54	3.92 (0.26)	3.27 – 5.60	77.24%	(73.65 – 80.83)
$FEF_{75\%}$ (l /s)	1.49 (0.66)	0.02 – 3.55	2.05 (0.17)	1.56 – 2.32	72.69%	(67.95 – 77.43)

3.12. Association between lung function and exposure to chemicals

Preliminary analyses on the association between work intensity and lung function is presented in Table 16. There is an association between years of working in hairdressing and FVC ($p=0.013$), FEV_1 ($p<0.01$), $FEF_{25-75\%}$ ($p=0.003$) and $FEF_{75\%}$ ($p=0.012$). Times of bleaching and dying were also significantly associated with both FVC and FEV_1. Age was significantly associated with almost all the lung function measures.

Table 17 shows that FVC and FEV_1 were significantly different among hairdressers with low exposure and those with high exposure to chemicals. This was assessed by calculating the number of times they used bleach and dye during their total working period. FVC was lower among hairdressers with high bleaching and dying score (p value = 0.02 for bleaching and 0.05 for dying). Additionally, FEV_1 was also lower among the ones with higher bleaching and dying score (p value = 0.02 for bleaching and <0.01 for dying). Multivariate analyses controlling for age will be performed as a part of the future PHD study.

Table 16. Lung function measurements for different groups within the hairdressers sample (Total N = 170) (ANOVA test)

LFT / Variables			FVC (l)		FEV_1 (l)		PEF (l/s)		$FEF_{25-75\%}$ (l/s)		$FEF_{75\%}$ (l/s)	
			Mean	P value	Mean	P value	Mean	P value	Mean	P value	Mean	P value
Age	18–23yrs	(n=65)	3.44		2.91		5.79		3.35		1.69	
	24–31yrs	(n=50)	3.44	< 0.01	2.88	< 0.01	5.70	0.062	3.18	< 0.01	1.58	< 0.01
	≥32 yrs	(n=55)	3.03		2.42		5.32		2.53		1.19	
Body Mass Index	Underweight	(n=7)	3.11		2.67		5.27		3.51		1.98	
	Normal weight	(n=99)	3.33	0.107	2.79	0.073	5.72	0.473	3.12	0.158	1.53	0.116
	Overweight	(n=49)	3.39		2.74		5.54		2.86		1.39	
	Obese	(n=15)	2.99		2.48		5.33		2.77		1.35	
Years of work in hairdressing	0.1–2yrs	(n=55)	3.44		2.89		5.69		3.25		1.58	
	2–5 yrs	(n=56)	3.37	0.013	2.83	< 0.01	5.69	0.46	3.18	0.003	1.63	0.012
	≥ 6 yrs	(n=59)	3.13		2.53		5.46		2.69		1.29	
Hours of work per day	2 – 5 hrs	(n=44)	3.47		2.85		5.59		3.08		1.54	
	6 – 7 hrs	(n=77)	3.24	0.118	2.70	0.185	5.43	0.069	3.04	0.871	1.51	0.710
	8–10 hrs	(n=49)	3.26		2.72		5.92		2.97		1.43	
Days of work per week	2–5days	(n=36)	3.40		2.79		5.42		2.97		1.47	
	6 days	(n=65)	3.32	0.433	2.79	0.253	5.62	0.473	3.16	0.384	1.56	0.587
	7 days	(n=69)	3.24		2.68		5.71		2.94		1.45	
Times of bleaching per week	0–1 tms	(n=72)	3.34		2.77		5.69		3.07		1.49	
	2–5 tms	(n=47)	3.49	0.003	2.84	0.023	5.67	0.46	2.99	0.889	1.49	0.982
	6–70tms	(n=51)	3.09		2.61		5.45		3.01		1.51	
Times of dying per week	0–3 tms	(n=63)	3.39		2.83		5.65		3.16		1.59	
	4–15tms	(n=57)	3.38	0.035	2.78	0.01	5.77	0.246	3.04	0.252	1.46	0.353
	16–70tms	(n=50)	3.12		2.59		5.39		2.86		1.42	
Number of clients per week	3–15clnts	(n=60)	3.36		2.81		5.51		3.14		1.16	
	16–30clnts	(n=68)	3.37	0.109	2.78	0.024	5.71	0.64	3.07	0.236	1.52	0.072
	31–100clnts	(n=42)	3.14		2.59		5.61		2.82		1.30	

Table 17. The association between intensity of exposure and selected lung function measurements (Univariate Linear Model)

LFT / Exposure		FVC (l) ◊					FEV1 (l) ◊					PEF (l/s) ◊				
		Mean	95% CI*	M.D.□	95% CI**	P	Mean	95% CI*	M.D.□	95% CI**	P	Mean	95% CI*	M.D.□	95% CI**	P
Bleaching score	Low	3.42	2.29 – 3.54	0.212	0.031 – 0.393	0.02	2.82	2.728 – 2.914	0.151	0.021 – 0.281	0.02	5.74	5.48 – 5.98	0.241	- 0.109 – 0.590	0.17
	High	3.20	3.08 – 3.33	-0.212	-0.393 – -0.031		2.67	2.578 – 2.762	-0.151	- 0.281 – - 0.021		5.49	5.25 – 5.74	- 0.241	- 0.590 – 0.109	
Dying score	Low	3.39	3.27 – 3.52	0.180	-0.001 – 0.362	0.05	2.87	2.78 – 2.96	0.263	0.136 – 0.389	< 0.01	5.72	5.47 – 5.96	0.216	- 0.133 – 0.566	0.22
	High	3.22	3.08 – 3.35	-0.180	- 0.362 – 0.001		2.61	2.52 – 2.70	-0.263	-0.389 – -0.136		5.50	5.25 – 5.75	-0.216	-0.566 – 0.133	

* 95% Confidence Interval of the mean

□ Mean Difference

** 95% Confidence Interval of the mean difference

◊ crude estimates

Figure 5. Mean FEV_1 values for hairdressers of different bleaching score by percentile

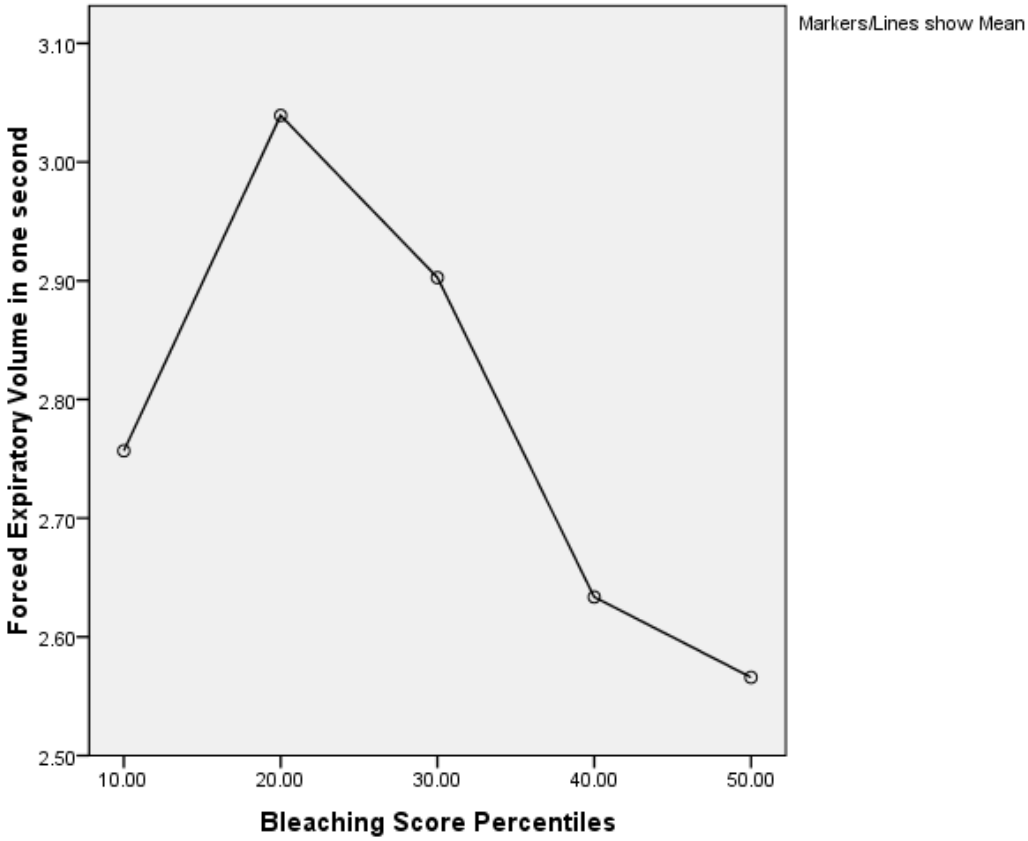
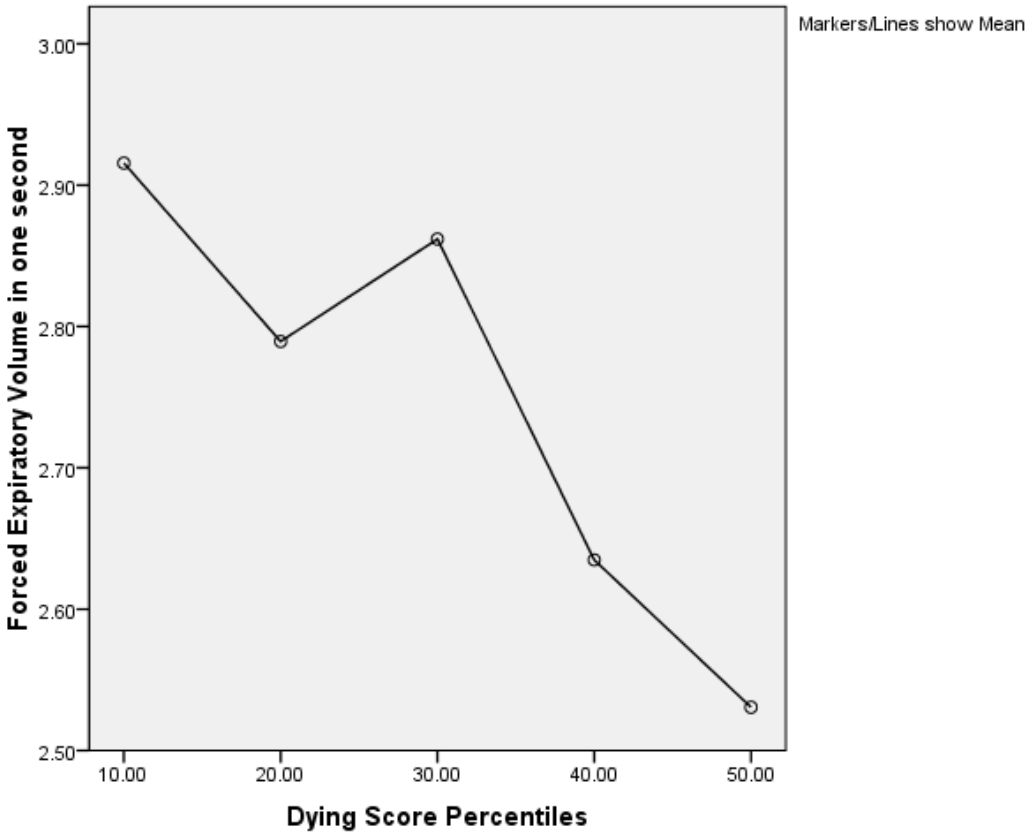


Figure 6. Mean FEV_1 values for hairdressers of different dying score by percentile



Chapter Four

DISCUSSION

IV. DISCUSSION

This study is the first occupational health study on female hairdressers in Palestine, as far as the author knows. The study included self reported respiratory symptoms, skin problems, lung function, working conditions, use of PPE, presence of ventilation, chemicals used in the salons and the most common tasks as well as knowledge about chemical health risks.

We found varied working conditions in the different hairdressing salons. The use of gloves, often latex, was common in most salons. These gloves were used sometimes during the dying and bleaching tasks but not when washing the hair. Almost none of the hairdressers were using masks or goggles. Few salons had proper ventilation.

Based on self reports, the prevalence of wheezing was 19%, 31% for tightness of chest and 28% for coughing. Prevalence of asthma was 5.9% and of hand dermatitis was 13.5%. The mean lung function values were a bit below the predicted values for the European standards; 96% of predicted value for FVC, 92% of predicted value for FEV_1 and 83% of predicted value for PEF.

Preliminary analyses showed association between number of working years in hairdressing and wheezing, tightness of chest, phlegm, and the basic lung function measurements, FVC and FEV_1. Hairdressers with high bleaching and dying scores had significantly lower lung function measurements than those with low scores. Additionally, the ones with higher dying scores had significantly more reported wheezing and tightness in the chest while the ones with higher bleaching scores had significantly more reported shortness of breath. Relatively low knowledge was found among the hairdressers about the chemicals they were using, but almost half of them related the health disorders they were having to their work tasks.

4.1. Methodological discussion

4.1.1. Study design

This is an epidemiological observational study, with a cross-sectional study design. The design was chosen because it is the only design which gives prevalence figures in addition to a measure

of association between exposures and outcomes. There are no previous studies on health problems and working conditions among hairdressers in Palestine, so it was considered appropriate to focus on descriptive data presentation. The present study could be useful for future cross-sectional studies on hairdressers to investigate possible improvements after a campaign. Additionally, cross-sectional studies can provide some ideas about etiology. Since most of the previous studies were done in the developed world, a similar study in the developing countries like Palestine would be useful for comparison of the findings.

A general problem with cross-sectional studies, however, is that it is not possible to decide if the exposure comes before the outcome or visa versa. We measured the outcomes, which were respiratory and skin problems, and the exposure, which were intensity of work and exposure to chemicals, at the same time. Therefore we cannot draw a firm conclusion regarding the risk factors.

4.1.2. Sample size

The power calculation for the sample size gave around 900 participants, and we included 200 due to limited time and budget for the study. It is known that a small sample size may have a risk of type II error (not detecting a real difference between the groups in the sample as statistically significant when it is a real difference). However, for the main purpose of the study, which is estimating the prevalence of symptoms and lung function and studying working conditions, the sample size is appropriate. The power calculation for the purpose of the prevalence estimation was 138 participants, based on an estimate of 18.3% with chronic cough. One way of avoiding random errors is to increase the sample size. Another problem we might have is that our sample size calculation was based on data from a study among farmers in Palestine and not from hairdressers, since there are no previous studies among hairdressers in Palestine or in other neighbouring countries. Using data from farmers might be not the best baseline to use for this calculation.

4.1.3. Systematic errors

In all epidemiological studies, there are possibilities of systematic errors. The main groups of errors to consider are: selection problems, information problems and confounding.

4.1.3.1. Selection problems**.** A bias in the estimates which occurs when there is a systematic difference between the characteristics of the people selected for a study and those who are not, or between the respondents and non respondents (14).

One possibility of getting this bias is by using improper procedure for selecting people from the population to be participants in the study (14). This is unlikely to be the case in our study, because a complete list of the female hairdressers was made from both registered and unregistered hairdressers in Hebron and then the sample was drawn from it. This made a similar chance for all hairdressers in Hebron City to be selected, i.e. similar chances for salons with low or high level of exposures and outcomes.

When participants take part in the study because they are worried about an exposure, bias may be introduced. In our study it is possible that the hairdressers who had most health complaints might have been more interested in taking part in the study than the ones who did not. This could be due to their perception that they will get some attention and advice. It could also be that those who were conscious about their health and safety were the ones who were more likely to participate, as it would give them a chance to check their lung function and get some more information regarding their safety.

Healthy worker effect is a common bias in epidemiological occupational health studies. This happens when the studied disease or health outcome itself makes people unavailable for the study. Workers who develop the disease tend to leave their job on their request or after medical advice. Therefore, the remaining workers are less affected (healthier). A prevalence study may be misleading (14). In addition, people who already have a disease or health complaint for example, eczema, would not become hairdressers. In our study, it is possible that the hairdressers who developed severe hand dermatitis, for example, have stopped their job, because the use of hands is so important in their work. Additionally, the ones who are atopic or have a history of asthma would also stop hairdressing in the early stages. Therefore, the prevalence of these health outcomes in our study may be underestimated because of this kind of selection.

In Hollund *et al.*'s (13) study, it was found that forty percent of the hairdressers in 1995 had left their profession by 1999, that was 5.7 times higher than the rate among office workers. In addition, former hairdressers had a higher prevalence of respiratory symptoms and self-reported asthma than current ones. Also, the prevalence of asthma, breathlessness and airway symptoms

was about the same among current hairdressers and the control group. All these findings indicate that hairdressers who remain in their profession for 20 years or more are highly selected and healthier than ex-hairdressers. People mostly affected by adverse effects of chemicals tend to quit their job. Those remaining are probably more resistant to the effects of exposure and do not experience too much discomfort from it, leading to underestimation of work-related disease in the salon, and the prevalence of airway symptoms will be falsely low.

4.1.3.2. Information problems. Recall is a kind of measurement bias that occurs when there is a differential recall of information by study groups (14). It is not likely that the recall, in the present study, is differential for different exposure categories. However, individual hairdressers reported the current situation (exposure) with respect to working tasks. The previous situation might have been different, which may have influence on the association measures to a weaker or stronger measure.

In order to reduce possible bias, all the hairdressers in our sample were tested for lung function by the same technician. None of the participants was encouraged more than the others to perform better in the test, they were all treated in the same way. The lung function test was performed for all the hairdressers in our sample by a trained and experienced technician, using a Spiro USB device which was calibrated. We made sure that all the hairdressers were tested at the same period of time during the day to avoid the effect of body changes. Additionally, we performed all the tests in the same season as the lung function is different in summer and winter seasons. For the questionnaire, it was translated from English to Arabic to prevent any language misinterpretations and back to English again to make sure that it did not lose the meaning during the translation process. A small piloting was also done for it beforehand.

One problem we had in our study was the lack of quantitative and objective exposure measurement. In order to get an idea about the level of exposure to chemicals among the hairdressers, we depended on what was reported about the intensity of work. This meant the number of working years, number of days per week, number of hours per day and number of clients per week. We also depended on the frequency of doing some tasks which involved dealing with chemicals (bleaching and dying) rather than using a measurement of air pollution or concentration of certain hazardous chemicals in the work environment.

In some studies, measurements regarding chemical concentration and effect of ventilation have been performed (31). Lack of such exposure measurements is a weakness in our study. Although the reported exposure variables that we have are not as strong as the measurements, it will give some idea about the level of exposure to chemicals at work and health problems.

When the participants fill in both exposure level and health outcome, a bias "dependency in data" may occur. The bias leads to false strong associations because some individuals tend to report both high (low) exposure and high (low) level of outcome. To avoid the problem, the outcome or exposure should be measured objectively or from another source than the questionnaire. In the present study, the measurement of lung function is an example of objective measurement of health outcome and the use of questionnaire regarding the level of exposure.

4.1.3.3. Confounding is a phenomenon when the association between an exposure and outcome is partially or totally explained by a third variable. This third variable is associated with both the exposure and outcome, and it is not an intermediate variable (68).

In studies like the present one, smoking and age are considered to be possible confounders because they have an effect on both lung function and symptoms and on exposure. However, in the present study none of the participants were smokers, except for two, which were excluded. Therefore, we have restricted our sample to non-smokers. Age, which is related to working years (exposure) and to lung function and symptoms, is considered as the most important confounder in our study. This was dealt with by adjusting the lung function results for age so that this effect was removed and we could get the real results according to exposure level or intensity of work. Furthermore, the lung function data could be adjusted for some other factors like height and weight (or BMI), place of living and educational level.

In the present report, we have aimed at giving preliminary crude estimates linking exposures to the outcomes. In future papers to be published, based on data from this thesis, multivariate analyses will be performed.

4.2. Discussion of findings

4.2.1. Work conditions and environment in the hairdressing salons in Hebron City.

It is a wide variation in the sizes of the salons (from 3 to 60 m^2), and it is likely that several smaller ones are not officially registered and licensed. The variation in sizes of studied salons was found also by Mounier *et al*. (69), who found a range of 52.2 to 288 m^3. In a study from Canada (42), a range of 70 to 160 m^2 among the 26 studied salons was found, which is similar to the range found by Hollund *et al.* (31) from 75 to 150 m^2 in the surface areas of the 6 studied salons in Norway. Most of the salons had ventilation places, like windows but few with air conditionings. Personal protective equipment was found in most of the salons. However, we found the majority of the hairdressers were using latex gloves when dying and bleaching but not when shampooing or conditioning while very few were having masks or goggles. In the UK study (59), it was found that gloves were worn by only 9% of the hairdressers when shampooing and 58% when perming.

4.2.2. Chemical ingredients of the products being used in the salons

Although the hairdressing salons use products from different manufacturers, they contained almost the same active ingredients. Many of the chemicals we have found were also reported in previous studies. The most common ones are; ammonia (31;69), which is a basic ingredient for hair dyes, bleaches and some straightening creams, hydrogen peroxide and persulfates (31;33;69) which are the most important ingredients of the bleaches. More chemicals like ethanol and other alcohol derivatives were also found in hairdressing salons in Canada (42). Another study from Canada (70) reported the chemicals found in hairdressing industry, including hydrogen peroxide, persulphates and different alcohol compounds.

The major components of hairdressing products which we found were also known to have potential negative effect on hairdressers' health. A guide for occupational health and safety published by the Association of hairdressers in New Zealand (32) reported all the chemical ingredients used in hairdressing profession and their risks on health. It showed that hydrogen peroxide can cause skin, eye and respiratory irritation. Furthermore, when ethanol and hydrocarbons present in hairsprays are inhaled, pain and irritation of the nose and throat might occur. Ammonium persulphate and Sodium sulphate are known to cause skin problems and mainly dermatitis (34). Additionally, persulphate salts, the basic component of bleaches, was found to be the major causal agent of occupational asthma (38;39;62). Ethanol and similar

alcohol compounds in hairspray were found to cause bronchoconstriction (35), and ammonia was reported as an allergen to skin and respiratory system (31).

Some studies have measured the concentration of the potential hazardous chemicals in hairdressing salons (31;33;42;69;71). The measured chemicals include; isopropanol, ethanol and ammonia which were detected in the salons studied in Norway (31). In a study from Finland (33), chemical ingredients of the hairdressing products were recorded, and some of them, especially ammonium and persulphates, were detected by measuring their concentration in the workplaces.

4.2.3. Knowledge of hairdressers about their exposure and possible adverse health effects

We found relatively little knowledge among the hairdressers about the chemicals they were using, the relation between their health complaints and their exposure at work. However, 74% of the hairdressers with hand dermatitis related this problem to their work. Similar results were reported by Leino, *et al.* (17) who found that 75% of the hairdressers who were having hand eczema believed that it become worse at work. The UK study (59) reported that two thirds of trainee hairdressers were not aware that atopic eczema predisposed to hand dermatitis. Knowledge on hand care among trainees was not often translated into practice, with gloves being worn by only 9% when shampooing and 58% when perming.

4.2.4. Respiratory symptoms

We found prevalence of 18.8 % for wheezing in the last 12 months. Higher prevalences were found in Norway (37%) (13) and New Zealand (40%) (20), while lower prevalences were found in Turkey (15%) (22), France (10%) (41) and Finland (4.8%) (16). Differences may be real, or due to different diagnostic tools across studies and differences in healthy workers effect (i.e. selection in- or out of the profession).

For the breathing difficulties, we found a prevalence of 31% for chest tightness and 25% for shortness of breath. This was similar to what was found in New Zealand (20) (29% of chest tightness), and Norway (13) (41% of breathlessness).

Additionally, we found a prevalence of 28% for chronic cough and 19% for chronic phlegm. This was also similar to the prevalence of 20% for cough in Turkey (22), although they found lower

prevalence of phlegm (4%). In Norway (13), 34% for cough for more than 14 days was found, which was similar to the results in two studies from Finland (16;17) that found 35.9% for cough and phlegm and to the ones in New Zealand (20) that found 36% for cough for the last 12 months. However, the study in France (41) found a prevalence of 4.3% for cough.

We report a prevalence of 5.9% for asthma, which is considerably lower than 14.6% that was reported in a study from Turkey (21). In a study of hairdressers from Finland (15), they found a 5.6% prevalence of asthma in 1980 and 10.1% in 1995. In a more recent study from Finland (16;17) they found 4.5% for asthma. In New Zealand (20) they found 24% for asthma, 15% for asthma attack in the last 12 months which is more than what we found (3.5%), and 14% for current asthma medication whereas we found 2.9%.

The level of asthma in the general population in Palestine is not known, and variations between countries may explain why there are differences in prevalence among hairdressers. Differences in diagnostic tools may also explain differences.

4.2.5. Skin disorders

We have reported a prevalence of 13.5% of hand dermatitis, of which 74% of the cases related it to their work. This result was similar to the one in Finland (17) (16.9%), but different from the one in Norway (14) (42% in which 61% related it to their work) and the one from U.K. (19) (38.6%). Differences could be due to diagnostic tools or other methodological issues.

4.2.6. Lung function test and its association with exposure and intensity of work

The mean lung function values were a bit below the predicted values for the European standards; 96% of predicted value for FVC, 92% of predicted value for FEV_1 and 83% of predicted value for PEF. In a study from New Zealand (20), higher lung function measurements were found, with 101% of predicted value for FVC, 99% of predicted value for FEV_1 and 88% of predicted value for PEF. However, our results were higher than what was found in Turkey (22), which was 90% for FVC, 84.6% for FEV_1 and 60.7% for PEF.

We found a significantly lower FVC and FEV_1 among hairdressers with higher level of exposure to chemicals than in the group of lower level. The study from Turkey (22), found a significantly

lower FEV_1 and PEF among hairdressers compared to a control group of office workers. Furthermore, the study from New Zealand (20) found significantly lower FVC among hairdressers compared to office and shop workers. In a study from France (41), FEV_1 was significantly lower in hairdressers than in office workers.

4.3. Generalization

The issue of external validity is the degree to which results of the study may apply, be relevant, or be generalized to populations or groups that did not participate in the study (72). As the study was conducted in Hebron City, which is one of the largest Palestinian cities, our results could be generalized to the other cities in the country, since it is likely that the hairdressers will be having similar working conditions, performing similar tasks and using similar chemicals, and they have similar culture and socio-economic status.

4.4. Conclusion

The present study has described the working and health situation the relation to chemical exposure in female hairdressers in Palestine, thus we have contributed to increase such information in a developing country.

Taken into consideration the possibilities for bias in the present epidemiologic occupational health study, we conclude that female workers in hairdressing salons in Palestine are exposed to chemicals which may harm the health. Furthermore, the use of personal protective measures and proper ventilation is limited. The knowledge about potentially harmful effects of chemical exposure is also limited. Although the healthy worker effect may reduce the number of workers with a disease or symptom of interest, we conclude that the prevalence of hand dermatitis and respiratory symptoms is high, and that the respiratory function is slightly reduced as compared with the European standard. Based on crude data, which may be prone to confounding, we report more respiratory and skin problems for some of the exposure variables (work intensity).

4.5. Recommendations

Follow up studies would be useful to get a clearer picture about the effect of chemical exposure and its risk on health. Further research, measuring exposure level, inside the salons, to find the actual exposure level, should be done. Increasing the knowledge and awareness among the hairdressing workers is of vital importance. This could be achieved by the formulation of work and safety guidelines for this group of workers and some informative workshops. Control of chemicals available in shops is needed. Healthier alternatives should be used, so chemicals which are known to be hazards could be forbidden. Less hazardous alternatives to different products should be provided in Palestine.

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APPENDICES

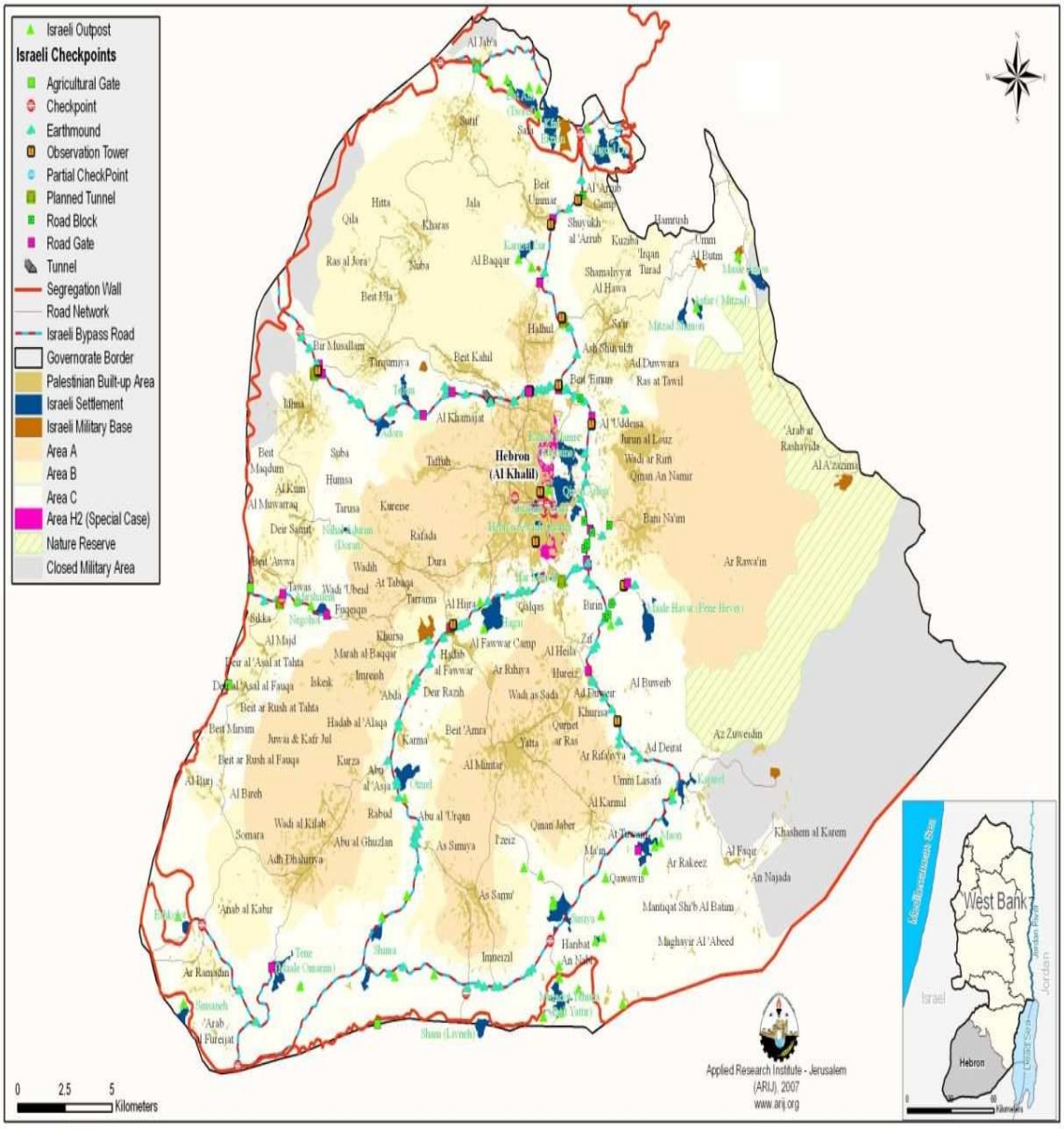
Appendix I

Country profile ------ Palestine

Geography

Palestine is situated on the Eastern cost of the Mediterranean Sea. It is bordering Lebanon in the North, Jordan in the East, Egypt and Red Sea in the South. The total area of Palestine is 26,323km². The Palestinian area, the West Bank and Gaza Strip are little over 6,000km²: 5,690km² for the West Bank and 365km² for the Gaza Strip. In spite of their limited area, those two small strips have the most exceptional climate and topographic structure. The West Bank and Gaza Strip are divided into several smaller districts.

Hebron is one of the largest cities in the Palestinian authority with an area of 997 km². It is located in the southern part of the west bank, 40 km south of Jerusalem. It lies 930 meters above sea level.



History

The Palestine problem became an international issue towards the end of the first-world war with the disintegration of the Turkish Ottoman Empire. Palestine was among the several former Ottoman Arab territories that were placed under the administration of Great Britain. All of these territories became fully independent state, as anticipated except Palestine. The Mandate had as a primary objective the implementation of the “Balfour Declaration” issued by the British Government in 1917, expressing

support for the establishment of a national home for the Jewish people in Palestine. From 1922 to 1947, large scale of Jewish immigration from abroad took place, the number swelling in the 1930s with the Nazi persecution of the Jewish population. Palestinians demand independence and resistance to Jewish immigration led to a rebellion in 1937, followed by continuing terrorism and violence till 1947 when the British Government turned the problem to the United Nation. The UN proposed the partitioning of Palestine into two independent nations, one Palestinian Arab and the other Jewish with Jerusalem international. In 1948 Israel envisaged in the partition plan and proclaimed its independence as Israel. In the 1948 war Israel expanded to occupy 77% of the territory of Palestine, and a larger part of Jerusalem. Over half of the indigenous Palestinian population were fled or were expelled. In the 1967 war, Israel occupied the remaining territory of Palestine, until then under Jordanian and Egyptian control, and the remaining part of Jerusalem. The second exodus of Palestinians estimated at half a million was also brought up. The security-council resolution 242 called for Israel to withdraw from the territories it had occupied in the 1967 war. In 1991, a peace conference on the Middle East was convened in Madrid with the aim of achieving a just, lasting and comprehensive peace settlement through direct negotiation between the two nations. This led to a mutual recognition between the government of Israel and the Palestine Liberation Organisation and the representative of the Palestinian people. This agreement brought several positive developments such as; the partial withdraw of Israeli forces, the elections of the Palestinian Council and the presidency of the Palestinian Authority, the partial release of the prisoners and the establishment of a functioning administration in the areas under the Palestinian self-rule. In September 2000, the second Intifada started a long series of violence and killing of civilians. Both Palestinians and Israelis were killed. The Israel forces used all types of heavy weapons against civilians. Till this date April 2002 more than 1500 Palestinians were killed. The Israeli forces surrounded all the occupied territories and closed all the roads. In March 2002 the Israeli tanks and helicopters entered the Palestinians towns and cities which led to situation described as a massacre (73).

Population and demography

The Palestinian world population is estimated at a bit more than 9 million. Only around 3.7 million (38.2%) of them live in the Palestinian territories and 11.2% of all them are living in Israel. The rest of the Palestinians are distributed in Jordan, Lebanon, Syria and the rest of the Arab world and some other foreign countries (74).

From the total number of population in Palestine (3.7 million), 2.3 million live in the West Bank and 1.4 million are in Gaza Strip (75).

The population growth rate is 3.3%, percent of population below 15 years is 45.7% and percent of them who are 65 years of age and over is 3.0% (World Health Organization, Country Profiles, Palestine, 2006).
The number of population in Hebron city is 551.1 thousand, which represent 14.7% of the total Palestinian population in the country (63).

Economy and industries

The Palestinian main sector that contributes to the output of the economy is the agricultural sector. There are also some small scale industries that contribute to the business in Palestine, such as stones, textile and garments, food processing, metal products and engineering, chemical industries like soaps, paints and detergents, pharmaceuticals and plastics (76). The Palestine economic standard is higher in the area of West Bank. The economy in Palestine has relied for many years upon using Israeli channels. Another vital market for Palestine market is Jordan. A major part of the export of Palestine is received by Jordan and Israel. Hebron city is famous for its grapes, limestone, pottery workshops and glassblowing factories.

Health care system

The current Palestinian health system is made up of fragmented services that grew and developed over generations and across different regimes (77). Four main providers (78;79) are responsible for primary, secondary, and tertiary health care; Palestinian Ministry of Health, Palestinian non-governmental organisations, the UN Relief and Works Agency (UNRWA) and the private sector (80).
Health services are financed through a mixture of taxes, health insurance premiums and co-payments, out-of-pocket payments, local community financial and in-kind donations and loans and grants from the international community (including the UN Relief and Works Agency) (78;79).
Several attempts to build a health-care system for the occupied Palestinian territory have been made in recent years, with some advances being achieved against the odds (79;81). However, despite the substantial amount of money injected into the system (79;82) and the two concluded national health plans (79;83;84), systemic goals remain far from met (77;79;85;86). This failure is mainly due to three inter-related factors—endogenous Palestinian features, donors' policies, and political havoc—that compromise the WHO building blocks (79).

Appendix II

Information sheet and consent form 1 (English)
Invitation letter and consent form 2 (English)

Invitation letter and consent form (Arabic)
Letter for the Association of Hairdressers in Hebron (Arabic)

Information sheet and consent form 1 (English)

Invitation to participate in the study:

"The prevalence of skin problems, respiratory symptoms and respiratory function, and the association with chemical exposure among female hairdressers in Hebron City, Palestine."

Hairdressers are exposed to several chemicals that are present in hair styling and care products which they apply during their work. These chemicals have been known to have irritant and sensitizing effects both on the airways and the skin.
Some previous studies showed that exposure to the chemicals in hairdressing products either by inhalation or touch and handling caused several health problems and symptoms, including asthma, bronchitis and hand eczema.
Most of the research was done in Europe and developed countries, with no any study in the Middle East including Palestine, so we will try in this study to investigate this problem in our part of the world.

The study will be a master research as a part of cooperation project between University on Oslo/Norway and Hebron University/Palestine, which will take place in Hebron under the supervision of the center of Epidemiology and Occupational Epidemiology research.

Purpose of the study
The main purpose of the study is to assess respiratory symptoms, respiratory effects and skin health problems among female hairdressers in Hebron city, and to compare these symptoms between different hairdressers according to level of exposure. In addition, the study will investigate and record all the products used in the salons and study their chemical ingredients. This study aims to find out if this exposure has a significant effect on the health of hairdressers and then try to produce kind of safety guidelines for them.

Who is invited to participate?
Female hairdressers who are working currently in hairdressing salons in Hebron, with the age between 18 and 50, and have been working in the current salon for at least one month.

Information to the participants:
You will be asked to fill in a questionnaire with some questions about your work and health status, to perform a lung function test using spirometer apparatus, and to allow us to record all the names of the products and their chemical ingredients that you use in your salon.
You ought to know that your participation in this study is voluntarily, without any repercussions and emphasize in the following points:

- Your response will be dealt with confidentially. The gathered information will be kept in safe places and no one will be allowed to have access to it except for research purpose
- You can refrain from answering any question during filling the questionnaire without providing reasons.
- You can withdraw from the research any time. Even if you agree now to be included in this study, you can change your mind later without being asked to give any reason for your decision.
- The results of the research will be published both locally and internationally, and you will receive the results of your test at the end.

Information on the results
When this study is completed (from August 2008 to June 2009), I will prepare a report containing results and the report will be distributed to the Ministry of Health and other health institutions that are interested in the results. The report will be available for all the participants as well.

For additional information or clarification, please don't hesitate to ask.
Maysaa Nemer
Occupational Epidemiology Research Lab.
Hebron University
Tel: 02-2220995 205

Declaration of consent for the study:

I am hereby declaring that I have received information on the study. I have been informed of the purpose of the above mentioned study, and that the information I will provide will be used for this study.
Besides, I have been informed that all the information I will provide will be treated strictly confidentially.
I have also been notified that I can later withdraw from this study if I intend to in the future.
Based on all that, I am hereby declaring that:
I agree voluntarily and without any repercussions that I will participate in this study.
Signature ----------
Date and place ----------

I confirm that I have given information about the study.
Investigator: Maysaa Nemer ----------.

Invitation letter and consent form 2 (English)

Center of Epidemiology & Occupational Epidemiology Research

Hebron University

Subject: Invitation letter to participate in a project and Consent form

Dear participant,

My name is Maysaa Nemer. I am a master student in International Community Health, Department of International Health, Institute of General practice and Preventive Medicine, Faculty of Medicine, University of Oslo, Norway. I am doing my master research as a part of cooperation project between University on Oslo and Hebron University, which will take place in Hebron under the supervision of our research center.

The study will focus on female hairdressers in the city. With a title of "The prevalence of skin problems, respiratory symptoms and respiratory function and the association with chemical exposure among female hairdressers in Hebron City, Palestine". It aims to investigate skin and respiratory symptoms as well as respiratory function and their relation to chemical exposure and work intensity.

I kindly request your participation in my study, you will be asked to answer some questions related to your job and health conditions by filling a questionnaire under the supervision and help of us, in addition to be tested for lung function by the spirometer apparatus, which is a short and simple test that lasts for not more than 5 minutes and needs blowing in special mouth piece for a certain period of time until we get the measurements.

Participation in the research is optional and will emphasize on the following points:

- Your response will be dealt with confidentially. The gathered information will be kept in safe places and no one will be allowed to have access to it except for research purpose
- You can refrain from answering any question during filling the questionnaire without providing reasons.
- You can withdraw from the research any time.
- The results of the research will be published both locally and internationally, and you will receive the results of your test at the end.

For additional information or clarification, please don't hesitate to ask.

Thank you in advance for your understanding and cooperation.

Please fill the following room for your decision:

------ Yes, I agree to participate in the study.

------ No, I don’t agree to participate in the study.

Name and signature ---------- Date ----------

Age ----------

Level of education ----------

Marital status ----------

Place of living ----------

If you would like to participate, when do you prefer to interview you:

Day ---------- date ---------- time----------

Address of the salon ----------

Telephone number ----------

Invitation letter and consent form (Arabic)

مركز علم الأوبئة و أبحاث الأوبئة الصناعية
جامعة الخليل

الموضوع: دعوة للمشاركة في بحث علمي

عزيزتي المشتركة
تحية و بعد ،،،،

يقوم مركز الأبحاث في جامعة الخليل و بالتعاون مع جامعة أوسلو في النرويج ، و كجزء من رسالة ماجستير، بدراسة ميدانية عن طبيعة عمل مصففات الشعر في مدينة الخليل و دراسة طبيعة المواد و المستحضرات التجميلية المستخدمة في صالونات التجميل و مدى تأثير التعرض المستمر لهذه المواد على صحة العاملات في هذا المجال و خاصة صحة الرئتين و الجهاز التنفسي و الجلد.

ندعوك للمشاركة في هذا البحث ،حيث المطلوب الإجابة عن مجموعة من الأسئلة في استبيان تتعلق بطبيعة عملك في صالون التجميل و التعرض للمواد و المستحضرات بالإضافة إلى القيام بفحص لمعدل التنفس ووظيفة الرئة، هذا الفحص يتم باستخدام جهاز صغير مرتبط ببرنامج و يطلب منك النفخ في أنبوب خاص لمدة 6 ثواني و يكرر ثلاث مرات ، حيث لا يتجاوز مدة الفحص أكثر من 5 دقائق.

المشاركة في البحث اختيارية و تؤكد على النقاط التالية:
- ستعامل إجاباتك عن الأسئلة بغاية من السرية ، حيث سنقوم بحفظ المعلومات بأماكن آمنة و لا يسمح بالاطلاع عليها إلا لأغراض علمية.
- تستطيعين الامتناع عن أي سؤال خلال المقابلة دون إبداء الأسباب.
- تستطيعين الانسحاب من البحث في أي وقت.
- سوف نقوم بنشر نتائج البحث داخليا و خارجيا، و سوف نزودك بنتائج فحصك بعد الانتهاء من الدراسة.

إذا كانت لديك أي استفسارات حول البحث أو أي أسئلة، لا تترددين في طرحها علينا و سوف نزودك بكل المعلومات المطلوبة.

شكرا جزيلا على التعاون

أرجو ملء الفراغ التالي حول رغبتك في المشاركة:
---------- نعم، ارغب في المشاركة
---------- لا، لا ارغب في المشاركة

الاسم و التوقيع ---------- التاريخ ----------
العمر ----------
المستوى الدراسي ----------
الحالة الاجتماعية ----------
مكان الإقامة ----------

إذا كنت ترغبين في المشاركة، متى تفضلين أن نقوم بمقابلتك:
اليوم ---------- التاريخ ---------- الساعة----------
عنوان الصالون ----------
رقم التلفون ----------

Letter for the Association of Hairdressers in Hebron (Arabic)

مركز علم الأوبئة و أبحاث الأوبئة الصناعية

جامعة الخليل

الموضوع: بحث علمي عن صحة العاملات في تصفيف الشعر في مدينة الخليل

السيد رجائي شاور المحترم
تحية و بعد ،،،،

يقوم مركز الأبحاث في جامعة الخليل و بالتعاون مع جامعة أوسلو في النرويج ، و كجزء من رسالة ماجستير للطالبة ميساء نمر، بدراسة ميدانية عن طبيعة عمل مصففات الشعر في مدينة الخليل و دراسة طبيعة المواد و المستحضرات التجميلية المستخدمة في صالونات التجميل و مدى تأثير التعرض المستمر لهذه المواد على صحة العاملات في هذا المجال و خاصة صحة الرئتين و الجهاز التنفسي و الجلد.

سوف يتم زيارة جميع صالونات التجميل في المدينة و دعوة السيدات للمشاركة بتعبئة استبيان يحتوي على مجموعة من الأسئلة حول طبيعة عملهن و وضعهن الصحي. بالإضافة إلى عمل فحص للتنفس يبين وظيفة الرئتين.

نرجو من حضرتكم إمدادنا بالمعلومات اللازمة عن الصالونات و مصففات الشعر في المدينة و عن النقابة الخاصة بهن.

و لكم جزيل الشكر.

د.خلدون نجم
مختبر علم الأوبئة و الأبحاث البيولوجية
كلية العلوم و التكنولوجيا
جامعة الخليل

Appendix III

Questionnaire for female hairdressing workers (English)

Questionnaire for female hairdressing workers (Arabic)

Questionnaire for female hairdressing workers

ID Code: ☐☐-☐☐☐
Date (mm.dd): - - 2008

I. General information

1. Age ☐☐
2. Marital status 1. ☐ Single
   2. ☐ Married
   3. ☐ Was married
3. Number of years of education ☐☐
4. Place of living 1. ☐ City
   2. ☐ Village
   3. ☐ Camp

II. Smoking

5. Do you now smoke daily, as of one month ago? 0. No ☐ 1. Yes☐

If you do not smoke each day now, please answer:

6. Have you ever smoked for as long as a year? 0. No ☐ 1. Yes☐
   (At least one cigarette per day for one year)
7. Did you quit smoking less than a year ago? 0. No ☐ 1. Yes☐
8. Did you quit smoking more than a year ago? 0. No ☐ 1. Yes☐

If you smoke or have smoked, please answer:

9. How old were you when you started smoking? ☐☐
10. How many years have you smoked altogether? ☐☐
11. How much do/did you smoke on average? ☐☐

(Number of cigarettes per day)

III. Occupational history and exposure

12. How many years have you been working in hairdressing? ☐☐
13. How many months a year, are you working in hairdressing? ☐☐
14. How many years ago did you finish your training? ☐☐
15. How many years have you been working in this salon? ☐☐
16. When did you start working in hairdressing?(mention year) ☐☐☐☐
17. Did you work in any other job? 0. No ☐ 1. Yes ☐

17. A. If yes specify ----------

---

18. What are the most frequent tasks done in this salon?

☐ 1. Cutting ☐ 4. Permanent waving

☐ 2. Dying ☐ 5. Straightening

☐ 3. Bleaching ☐ 6. Others

19. Which of them are you doing most frequently?

☐ 1. Cutting ☐ 4. Permanent waving

☐ 2. Dying ☐ 5. Straightening

☐ 3. Bleaching ☐ 6. Others

20. What are the products mostly used in this salon?

☐ 1. Shampoo ☐ 4. Hair dyes ☐ 7. Permanent wave solution

☐ 2. Conditioner ☐ 5. Henna ☐ 8. Straightening creams

☐ 3. Hairspray ☐ 6. Bleaching powder ☐ 9. Others

21. Which of them are you using most frequently?

☐ 1. Shampoo ☐ 4. Hair dyes ☐ 7. Permanent wave solution

☐ 2. Conditioner ☐ 5. Henna ☐ 8. Straightening creams

☐ 3. Hairspray ☐ 6. Bleaching powder ☐ 9. Others

22. Do you read or know about the ingredients of these products? 0. No ☐ 1. Yes ☐
23. How many hours a day do you work on average? ☐☐
24. How many days a week do you work? ☐☐

25. How many times a week do you apply the following:

a. Bleaching ☐☐

b. Dying ☐☐

c. Permanent waving ☐☐

d. Straightening ☐☐

26. How many clients a week is it:

a. In average in the salon. ☐☐

b. In addition, by yourself (alone). ☐☐

IV. Health status

General and history

27. Do you suffer from any health problem or disease? 0. No ☐ 1. Yes☐

27. A. If yes, specify ----------

---

28. Do you think it is related to your job? 0. No ☐ 1. Yes☐

29. Have you been treated (even as a child) by doctor or in hospital for any of the following:

a. Pneumonia 0. No ☐ 1. Yes☐

b. Bronchitis 0. No ☐ 1. Yes☐

c. COPD 0. No ☐ 1. Yes☐

d. Asthma 0. No ☐ 1. Yes☐

e. Lung fibrosis 0. No ☐ 1. Yes☐

f. Rhinitis 0. No ☐ 1. Yes☐

g. Eye or nasal allergy (hay fever) 0. No ☐ 1. Yes☐

h. Hand eczema 0. No ☐ 1. Yes☐

(Irritative or allergic, including eczema as a child)

i. Heart disease 0. No ☐ 1. Yes☐

i. 1. If yes, please specify ----------.

30. Do you use any form of medication 0. No ☐ 1. Yes☐

30. A. If yes, please specify:

☐ 1. Tablets ☐ 3. Cream prescribed by a doctor

☐ 2. Eye/nose drops ☐ 4. Asthma spray

30. B. If you use other types, please specify ----------

Respiratory symptoms

31. Have you had wheezing or whistling in your chest, at any time in the last 12 months?

0. No ☐ 1. Yes☐

32. Have you been woken up with a feeling of tightness in your chest first thing in the morning at any time in the last 12 months?

0. No ☐ 1. Yes☐

33. Have you at any time in the last 12 months had an attack of shortness of breath that came on during the day when you were not doing anything strenuous?

0. No ☐ 1. Yes☐

34. Have you had an attack of shortness of breath that came on after you stopped exercise at any time in the last 12 months?

0. No ☐ 1. Yes☐

35. Have you at any time in the last 12 months been woken at night by an attack of shortness of breath?

0. No ☐ 1. Yes☐

36. Have you at any time in the last 12 months been woken at night by an attack of coughing?

0. No ☐ 1. Yes☐

37. Do you usually cough first thing in the morning?

0. No ☐ 1. Yes☐

38. Do you usually bring up phlegm from your chest first thing in the morning?

0. No ☐ 1. Yes☐

39. Have you brought up phlegm from your chest like this most mornings for at least 3 months each year?

0. No ☐ 1. Yes☐

40. Which of the following statements best describes your breathing:

1. ☐ I never or only rarely get trouble with my breathing.
2. ☐ I get regular trouble with my breathing, but it always gets completely better.
3. ☐ My breathing is never quite right.

41. When you are in a dusty part of the house or with animals (for instance dogs, cats or horses) or near feathers (including pillows, quilts and eiderdown) do you ever:
    a. Get a feeling of tightness in your chest? 0. No ☐ 1. Yes☐
    b. Start to feel short of breath? 0. No ☐ 1. Yes☐

Respiratory symptoms at work

42. Do you feel any of the following during your working hours:
    a. Breathe shortness. 0. No ☐ 1. Yes☐
    b. Cough. 0. No ☐ 1. Yes☐
    c. Tightness in the chest. 0. No ☐ 1. Yes☐
    d. Symptoms from the eyes (running) 0. No ☐ 1. Yes☐
    e. Symptoms from the nose (sneezing, runny or blocked) 0. No ☐ 1. Yes☐
43. Do you feel any of the following directly after exposure to spray:
    a. Breathe shortness. 0. No ☐ 1. Yes☐
    b. Cough. 0. No ☐ 1. Yes☐
    c. Tightness in the chest. 0. No ☐ 1. Yes☐
    d. Symptoms from the eyes (running) 0. No ☐ 1. Yes☐
    e. Symptoms from the nose (sneezing, runny or blocked) 0. No ☐ 1. Yes☐
44. Do you feel any of the following during preparation of dye:
    a. Breathe shortness. 0. No ☐ 1. Yes☐
    b. Cough. 0. No ☐ 1. Yes☐
    c. Tightness in the chest. 0. No ☐ 1. Yes☐
    d. Symptoms from the eyes (running) 0. No ☐ 1. Yes☐
    e. Symptoms from the nose (sneezing, runny or blocked) 0. No ☐ 1. Yes☐
45. Do you feel any of the following during preparation of bleach:
    a. Breathe shortness. 0. No ☐ 1. Yes☐
    b. Cough. 0. No ☐ 1. Yes☐
    c. Tightness in the chest. 0. No ☐ 1. Yes☐
    d. Symptoms from the eyes (running) 0. No ☐ 1. Yes☐
    e. Symptoms from the nose (sneezing, runny or blocked) 0. No ☐ 1. Yes☐
46. Have you ever had asthma? 0. No ☐ 1. Yes☐
47. If yes, was it:

1. ☐ During childhood.
2. ☐ As an adult.
3. ☐ Presently.

48. Have you had an attack of asthma at any time in the last 12 months?

0. No ☐ 1. Yes☐

49. Are you currently taking any medicines for asthma?

0. No ☐ 1. Yes☐

50. Did the asthma start during the last ten years?

0. No ☐ 1. Yes☐

51. Has any in your family ever had asthma?

0. No ☐ 1. Yes☐

(Mother, father, children, brothers or sisters)

Skin problems

52. Do you have the following symptoms or diseases currently:

Hand eczema. 0. No ☐ 1. Yes☐

(Allergy or irritative)

53. If any, when did it started the first time? (specify year) ☐☐☐☐

54. Is it related to your work nature, including wet hands tasks or handling of chemical products? 0. No ☐ 1. Yes☐

55. Do you have holes in your ears? 0. No ☐ 1. Yes☐

V. Protective methods

56. Do you use any of the following during work?

a. Gloves 0. No ☐ 1. Yes☐

a. 1. If yes, what kind of gloves? 1. ☐ Rubber (latex) 2. ☐ Plastic (PVC)

b. Nose cover 0. No ☐ 1. Yes☐

c. Goggles 0. No ☐ 1. Yes☐

Questionnaire for female hairdressing workers (Arabic)

ID Code: □□-□□□
Date (mm.dd): - - 2008

الاستبيان ا لمتعلق بمصففات الشعر

I. معلومات شخصية

1. السن □□
2. الحالة الاجتماعية 1- عزباء 2- متزوجة 3- كنت متزوجة □
3. عدد سنوات الدراسة □□
4. مكان السكن 1- مدينة 2- قرية 3- مخيم □

II. التدخين

5. هل تدخنين الآن يوميا، مثلما كنت قبل شهر؟ 0- لا 1- نعم □
6. هل سبق و أن دخنت لمدة سنة متواصلة (على الأقل سيجارة يوميا لمدة سنة)؟ 0- لا 1- نعم □
7. هل أقلعت عن التدخين قبل اقل من سنة؟ 0- لا 1- نعم □
8. هل أقلعت عن التدخين قبل أكثر من سنة؟ 0- لا 1- نعم □

إذا كنت تدخنين الآن أو دخنت، أرجو الإجابة عن الأسئلة التالية:

9. كم كان عمرك عندما بدأت التدخين لأول مرة؟ □□
10. كم عدد السنوات التي دخنت فيها معا؟ □□
11. ما هو معدل عدد السجائر التي تدخنيها يوميا؟ (سجائر/ يوم) □□

III. تاريخ العمل و التعرض المهني

12. كم عدد السنوات التي كنت تعملين بها في تصفيف الشعر؟ □□
13. كم شهر في السنة تعملين في تصفيف الشعر؟ □□
14. منذ كم سنة أنهيت تدريبك للعمل في المهنة؟ (عدد السنوات) □□
15. كم عدد السنوات التي عملتي فيها في هذا الصالون؟ □□
16. متى بدأت العمل في تصفيف الشعر؟ (اذكري السنة) □□□□
17. هل عملت في أي مهنة أخرى من قبل؟ 0- لا 1- نعم □

إذا كانت الإجابة نعم، اذكريها: ----------

18. ما هي العمليات التي تقومون بها بشكل كبير أكثر من غيرها (باستمرار) في هذا الصالون؟ □

1- قص الشعر 2- صبغ الشعر 3- التبييض (سحب اللون)

4- التجعيد الدائم 5- التمليس 6- غيرها

19. أي من هذه العمليات تقومين بها بنفسك بشكل كبير؟ ☐

1- قص الشعر 2- صبغ الشعر 3- التبييض (سحب اللون)

4- التجعيد الدائم 5- التمليس 6- غيرها

20. ما هي مستحضرات التجميل التي تستخدم بشكل مستمر كثيرا في هذا الصالون؟ ☐

1- شامبو 2- بلسم 3- مثبت الشعر (سبراي)

4- صبغات 5- حناء 6- مزيل اللون من الشعر

7- مواد التجعيد الدائم 8- كريم التمليس 9- غيرها

21. أي من هذه المستحضرات تستخدمين بشكل اكبر أو مستمر؟ ☐

1- شامبو 2- بلسم 3- مثبت الشعر (سبراي)

4- صبغات 5- حناء 6- مزيل اللون من الشعر

7- مواد التجعيد الدائم 8- كريم التمليس 9- غيرها

22. هل تقرأين على العلبة أو تعلمين عن المكونات الموجودة بداخل هذه المستحضرات؟ 0- لا 1- نعم ☐

23. كم ساعة في اليوم تعملين (معدل الساعات)؟ ☐☐

24. كم يوم في الأسبوع تعملين؟ ☐☐

25. كم مرة في الأسبوع تستخدمين التالي:

أ- التبييض (سحب اللون) ☐☐

ب- الصبغة ☐☐

ج- التجعيد ☐☐

د- التمليس ☐☐

26. كم زبونة في الأسبوع يأتي (معدل عدد الزبائن في الأسبوع):

أ- إلى الصالون ☐☐

ب- تعملين لها بنفسك ☐☐

IV. الوضع الصحي

الوضع الصحي العام و التاريخ الصحي

27. هل تعانين من أي مشاكل صحية أو أمراض؟ 0- لا 1- نعم ☐

27. أ. إذا كانت الإجابة نعم، حددي ----------

28. هل تعتقدين أن هذه المشاكل لها علاقة بطبيعة عملك؟ 0-لا 1- نعم ☐

29. هل سبق و أن تعالجت (حتى و أنت طفلة) من قبل طبيب أو في مستشفى لأي من الأمراض التالية:

أ- الالتهاب الرئوي 0- لا 1- نعم ☐

ب- التهاب في القصبات الهوائية 0- لا 1- نعم ☐

ج- مرض انسداد الشعب الهوائية المزمن 0- لا 1- نعم ☐

د- الربو (الأزمة) 0- لا 1- نعم ☐

ه- تليف الرئة 0- لا 1- نعم ☐

و- التهاب الأنف 0- لا 1- نعم ☐

ز- حساسية في العين و الأنف (حمى القش) 0- لا 1- نعم ☐

ح- اكزيما في اليدين 0- لا 1- نعم ☐

(التهابات جلدية، تهيج أو حساسية، من ضمنها الاكزيما و أنت طفلة)

ط- أمراض في القلب 0- لا 1- نعم ☐

ط.1. إذا كانت الإجابة نعم، حددي: ----------

30. هل تستخدمين أي نوع من الأدوية بوصفة طبيب؟ 0- لا 1- نعم ☐

30. أ. إذا كانت الإجابة نعم، ما هو نوعها؟ 1- حبوب أو كبسولات ☐

2- قطرة للعين أو الأنف

3- دهون للجلد بوصفة طبيب

4- بخاخ للربو (للازمة)

30. ب. إذا كنت تستخدمين أنواع أخرى، حددي: ----------

الأعراض التنفسية

31. هل حدث و أن صدر صوت صفير من صدرك في أي وقت خلال أل 12 شهر الماضية؟

0- لا 1- نعم ☐

32. هل حدث و أن أفقت من نومك في الصباح على شعور بضيق في الصدر في أي وقت خلال أل 12 شهر الماضية؟

0- لا 1- نعم ☐

33. هل حدث في أي وقت من أل 12 شهر الماضية و أصابك نوبة من ضيق التنفس التي تأتي خلال اليوم و عندما لا تعملين أي مجهود؟ ☐

0- لا 1- نعم

34. هل حدث لك ضيق في التنفس عندما تتوقفين عن عمل تمارين رياضية أو أي مجهود في أي وقت خلال أل 12 شهر الماضية؟ ☐

0- لا 1- نعم

35. هل حدث في أي وقت خلال أل 12 شهر الماضية و أن أفقت في الليل من نومك على نوبة من ضيق التنفس؟

0- لا 1- نعم ☐

36. هل حدث في أي وقت خلال أل 12 شهر الماضية و أن أفقت في الليل من نومك على نوبة من السعال؟

0- لا 1- نعم ☐

37. هل يحدث لديك سعال عادة عندما تفيقين من النوم في الصباح مباشرة؟

0- لا 1- نعم ☐

38. هل تخرجين بلغم عادة عندما تفيقين من النوم في الصباح مباشرة؟

0- لا 1- نعم ☐

39. هل حدث و أخرجت بلغم من صدرك عندما تفيقين في الصباح مباشرة لمدة 3 أشهر في السنة على الأقل؟

0- لا 1- نعم ☐

40. أي من العبارات التالية تصف تنفسك بشكل أفضل: ☐

1- لم يحدث أبدا أو حدث نادرا و أن عانيت من مشاكل في التنفس

2- يحدث لي مشاكل مستمرة في التنفس، و لكنها دائما تتحسن بشكل كامل

3- يوجد لدي مشاكل دائمة في التنفس

41. عندما تكونين في مكان مغبر من المنزل أو مع حيوانات (كلب، قط، حصان) أو بجانب ريش (وسائد، لحف)، هل سبق و أن شعرت بالتالي:

أ- ضيق في الصدر 0- لا 1- نعم ☐

ب- ضيق أو قصر في التنفس 0- لا 1- نعم ☐

الأعراض التنفسية أثناء العمل

42. هل تشعرين بأي من الأعراض التالية أثناء ساعات عملك:

أ- ضيق أو قصر أو صعوبة في التنفس 0- لا 1- نعم ☐

ب- سعال 0- لا 1- نعم ☐

ج- ضيق في الصدر 0- لا 1- نعم ☐

د- أعراض في العين (حساسية/ احمرار/ دموع) 0- لا 1- نعم ☐

ه- أعراض في الأنف (عطس/ سيلان/ احتقان أو انسداد) 0- لا 1- نعم ☐

43. هل تشعرين بأي من الأعراض التالية مباشرة بعد التعرض لمثبت الشعر (سبراي):

أ- ضيق أو قصر أو صعوبة في التنفس 0- لا 1- نعم ☐

ب- سعال 0- لا 1- نعم ☐

ج- ضيق في الصدر 0- لا 1- نعم ☐

د- أعراض في العين (حساسية/ احمرار/ دموع) 0- لا 1- نعم ☐

ه- أعراض في الأنف (عطس/ سيلان/ احتقان أو انسداد) 0- لا 1- نعم ☐

44. هل تشعرين بأي من الأعراض التالية أثناء تحضيرك لصبغة الشعر:

أ- ضيق أو قصر أو صعوبة في التنفس 0- لا 1- نعم ☐

ب- سعال 0- لا 1- نعم ☐

ج- ضيق في الصدر 0- لا 1- نعم ☐

د- أعراض في العين (حساسية/ احمرار/ دموع) 0- لا 1- نعم ☐

ه- أعراض في الأنف (عطس/ سيلان/ احتقان أو انسداد) 0- لا 1- نعم ☐

45. هل تشعرين بأي من الأعراض التالية أثناء تحضيرك لمادة التبييض:

أ- ضيق أو قصر أو صعوبة في التنفس 0- لا 1- نعم ☐

ب- سعال 0- لا 1- نعم ☐

ج- ضيق في الصدر 0- لا 1- نعم ☐

د- أعراض في العين (حساسية/ احمرار/ دموع) 0- لا 1- نعم ☐

ه- أعراض في الأنف (عطس/ سيلان/ احتقان أو انسداد) 0- لا 1- نعم ☐

46. هل سبق و أن عانيت من الربو (الأزمة)؟ 0- لا 1- نعم ☐

47. إذا كانت الإجابة نعم، هل حدث ذلك:

1- خلال طفولتك ☐

2- و أنت بالغة

3- حاليا

48. هل حدث لك نوبة من الربو في أي وقت خلال أل 12 شهر الماضية؟ 0- لا 1- نعم ☐

49. هل تأخذين أي أدوية للربو حاليا؟ 0- لا 1- نعم ☐

50. هل بدأ الربو لديك خلال أل 10 سنوات الماضية؟ 0- لا 1- نعم ☐

51. هل يعاني أو سبق أن عانى أي من أفراد أسرتك من الربو؟ 0- لا 1- نعم ☐
(الأم، الأب، الأبناء، الأخوة، الأخوات)

الأعراض و المشاكل الجلدية

52. هل لديك الأعراض أو المشاكل التالية حاليا:

اكزيما في اليدين (التهابات جلدية، حساسية أو تهيج) 0- لا 1- نعم ☐

53. إذا كانت الإجابة نعم، متى بدأت أول مرة (حددي السنة) ☐☐☐☐

54. هل لها علاقة بطبيعة عملك 0- لا 1- نعم ☐
(الأيدي الرطبة دائما أو استخدام المستحضرات الكيميائية)

55. هل لديك ثقب في أذنك؟ 0- لا 1- نعم ☐

V. الوسائل الوقائية

56. هل تستخدمين أي من الآتية خلال ممارستك لعملك:

أ- كفوف لليدين 0- لا 1- نعم ☐

ب- إذا كنت تستخدمينها، أي نوع من الكفوف: 1. مطاطية

2. بلاستيكية

ج- غطاء للأنف 0- لا 1- نعم ☐

د- نظارات واقية 0- لا 1- نعم ☐

Appendix IV

Lung Function Test Results Form

Lung Function Test Results Form

ID Code: □□-□□□
Date (mm.dd): - - 2008

Subject's characteristics and lung function:

1. Age at examination (years) □□
2. Height (cm) □□□
3. Weight (kg) □□□
4. Temperature of the place □□□

	Pred	Measured. Best of three manoeuvres	% of pred
FVC (l)	□.□□	□.□□	□□□
FEV_1 (l)	□.□□	□.□□	□□□
PEF (l/s)	□.□□	□.□□	□□□
$FEF_{25-75\%}$ (l/s)	□.□□	□.□□	□□□
$FEF_{75\%}$ (l/s)	□.□□	□.□□	□□□

Appendix V

Checklist form for the hairdressing salon

Checklist form for the hairdressing salon

Check list in each salon

Salon code ☐☐

General conditions

1. Surface area (size) ☐☐
2. Number of workers ☐☐
3. Presence of ventilation. yes☐ no☐
4. What type of ventilation is used?

   ---

5. How many ventilation places are there in the salon? ☐☐

   (Number and size of the windows)
6. Presence of PPE yes☐ no☐
7. Type of PPE ----------

Chemicals used in the salon

Hairdressing product	Chemicals present in it
Hairspray	
Bleaching powder	
Hair dyes	
Permanent oil	
Straightening creams	
Gels	
Wax	