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**ANNUAL SURVEILLANCE REPORT**

**OCCUPATIONAL SKIN ALLERGIES**

Anna fourie<sup>1</sup>  
Munyadziwa Muvhali<sup>1</sup>  
Tanusha Singh<sup>1</sup>  
Kerry Wilson<sup>2</sup>  
Nisha Naicker<sup>2</sup>

<sup>1</sup>Immunology & Microbiology Section

<sup>2</sup>Epidemiology & Surveillance Section

25 Hospital Street, Constitution Hill,  
Johannesburg, 2000

Tel: +27 (0)11 712 6475 | Fax: +27 (0)11 712 6426

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## 1. Glossary

<b>Allergens</b>	A substance capable of triggering a response that starts in the human immune system and results in sensitisation or an allergic reaction
<b>Atopic patients</b>	Patients that tested positive to three or more tests in the aeroallergens panel
<b>Contact dermatitis</b>	A reactive eczematous inflammation of the skin, which occurs after direct contact with a substance (chemical, biological or physical agent/s). Symptoms include itching, erythema, blisters, exudation, papules and flaking.
<b>Allergic contact dermatitis (ACD)</b>	An immune response on a localized region of the skin, due to contact with an allergen to which an individual is sensitized
<b>Irritant contact dermatitis (ICD)</b>	A contact dermatitis, which occurs when an irritant substance has caused damage to the skin (tissue)
<b>ESS</b>	European Standard Series
<b>Industry</b>	The industry where the patients worked at time of exposure were grouped into categories according to the Standard Industrial Classification of all economic activities (7th Edition)
<b>Job</b>	The activity that the patient does while on duty
<b>NIOH</b>	National Institute for Occupational Health
<b>Occupational allergy</b>	A condition resulting from exposure to allergens or chemicals while “on the job” such as contact dermatitis, urticaria, asthma, rhinitis, conjunctivitis,
<b>OAU</b>	Occupational Allergy Unit
<b>N-O</b>	Non-occupational
<b>OSDC</b>	Occupational Skin Disease Clinic
<b>Panel</b>	A set of allergens used to test for skin allergies depending on the exposure. The European standard series is a set of the most common allergens that are associated with allergic contact dermatitis. Other exposure-specific series include: hairdressing, cosmetic, metalworking oil series, shoe, rubber, epoxy resin, dental series
<b>Patient</b>	All workers or persons referred (internal or external) to the NIOH for skin allergy testing
<b>Type of sample</b>	Substance from the workplace that is suspected as the causative agent

## 2. Executive Summary

In 2018, 73 patients from various industries, and non-occupational patients visited the occupational skin allergy clinic at the NIOH. A total of 66 patients were tested for skin allergies. Of these patients, 40% were diagnosed with allergic contact dermatitis, 15% were diagnosed with both allergic and irritant contact dermatitis and 11% were diagnosed with irritant contact dermatitis only. The remainder were a mix of other diagnoses such as 3% atopic dermatitis and 1% photo contact dermatitis reactions.

Patch tests were used to test for possible contact allergies. Testing was conducted using a battery of commercial allergens (patch test series) as well as substances from the patient's workplace. Data were obtained from patient records and entered into excel. The data was imported into STATA SE version 15 for analyses, post cleaning and removal of duplicates. Summary measures have been presented in this report.

The majority of patients were in the 40-49year-old age group. However, there were a higher proportion of > 40year-old patients in the non-occupational(N-O) group compared to the occupational group. The sex distribution was different among workers and non-occupational with 66% males in the worker group and 90% female in the non-occupational (N-O) group.

The main industries that referred patients were the manufacturing and the mining industry (27.3%), followed by health (15.9%) and business (15.9%). The N-O patients were from business (25%), health (21%) and education (20%)

The highest proportion of tests performed were for the European Standard Series (ESS) accounting for 89% of all tests followed by the cosmetic series (40,9%). Approximately 51% of patients tested positive for ESS series allergens. The top allergens identified were nickel, methylisothiazolinone, Balsam of Peru, cobalt chloride and Fragrance mix II, among both groups whereas potassium dichromate and epoxy resin were common among the OC group and MCI/MI and fragrance mix I were common among the N-O

Almost half (43.8%) of patients reported atopy. The atopic individuals were predominately female and worked mostly in health (20%), followed by mining (18%) and manufacture of metal products (16%).

Although there are limitations to the data such as the lack of generalisability, it should be noted that even for the non-occupational, the manufacturing industry followed by the health sector had the highest proportion of patients with symptoms and positive allergy tests. Further investigation is required to assess the working environment and provide appropriate preventive controls.

### 3. Background

Occupational skin diseases (OSD) are among the most common type of occupational diseases which occur in the workplace. Worldwide it is known that these conditions are under-recognised, under-diagnosed, under-reported and under-compensated. Early diagnosis of OSD is crucial, as prolonged exposure is more likely to lead to intractable dermatitis which persists after removal from exposure. Therefore, a need for an OSD diagnostic service in South Africa was identified and an occupational skin disease clinic was initiated at the Immunology & Microbiology Section, NIOH.

As approximately 80-90% of OSD patients present with contact dermatitis (CD), which can be either irritant (ICD) or allergic (ACD) in nature, patch testing is done to differentiate between the two forms. This is important since ICD & ACD have different management requirements. Patch tests with commercially available allergen series, either the European standard series (general most common allergens that cause allergic contact dermatitis) or different exposure-specific series (e.g. cosmetic, dental, hairdressing, nail series etc.) enhance the detection of sensitisation to specific allergens. The Immunology & Microbiology Section hold an extensive allergen bank and a list of the allergens can be made available on request. From the clinic, permission is obtained from the patients to capture their information into a comprehensive database in order to look at trends in OSD. This is an important process since little is known about the extent and type of OSD which occur in South Africa and the industries in which these occur. The OSDC database, which was donated by the British Contact Dermatitis group, was started in 2005 and there are 898 patient records captured into the database. The database records the patients' demographics, the occupation and industry in which they work; their atopic status; the part of the body which is affected and the type of skin disease.

This report can be accessed at: <http://niohweb.nhls.ac.za/>

### 4. Methods

The data presented in this report summarises the data of patients presenting with suspected occupational skin diseases/allergies at the occupational skin clinic in 2018. Patients are referred by occupational health practitioners, dermatologists, company health and safety representatives & wellness programs and from public hospital clinics.

Patients are referred to the NIOH from areas in and around Gauteng as well as North West (Rustenburg), Mpumalanga, Limpopo and the Free State. This includes patients who came for follow-up, for further testing or for requests from insurance, or for completion of documents for the Compensation Commission.

Although contact dermatitis can occasionally be classified as allergic or irritant by a physical examination, this is not always the case, often an irritant dermatitis is identified by negative patch testing. For this reason, patch testing is important; also for identifying a causative allergen, in the case of allergic contact dermatitis in order to avoid the offending substance and possible job loss.

Referrals from companies were seen by the consultant dermatologist and patch tests were conducted by staff of the Immunology & Microbiology Section who are deemed competent to perform the test.

A patch test is conducted by placing the allergens, including a negative control on a patch test unit having 10 chambers. These strips are placed on the patients back for 2 days. They then return to the clinic for reading of the results. The most common patch test series tested in 2018 at the OSDC was

the European standard series. This is a good starting point as it includes the most common allergens which cause contact dermatitis. However, several other series were also used for testing depending on the awareness of the occupational exposures. The cosmetic series is important not only for testing for reactions to self-care products but also for testing beauticians that work with cosmetics all the time. The rubber series is critical for healthcare workers who commonly wear rubber gloves but also for factory workers or miners who wear rubber gloves, rubber boots or rubber containing respirators as well.

Data from the OSDC files were entered into an Access database, which was then imported into STATA SE version 15 for data analysis. Summary measures consisting of means, medians and interquartile ranges for all continuous or discrete study variables were documented. Frequencies (numbers and percentages) were produced for categorical data.

Atopic patients were defined as those who had a history of childhood eczema &/or had a family history of atopy and/or tested positive to three or more allergens in the aeroallergens panel by skin prick test.

## 5. Results

Of the 73 patients that presented at the OSDC, two thirds were referred as occupational cases. They ranged in age from 10-71 years.

### 5.1 Sociodemographic characteristics

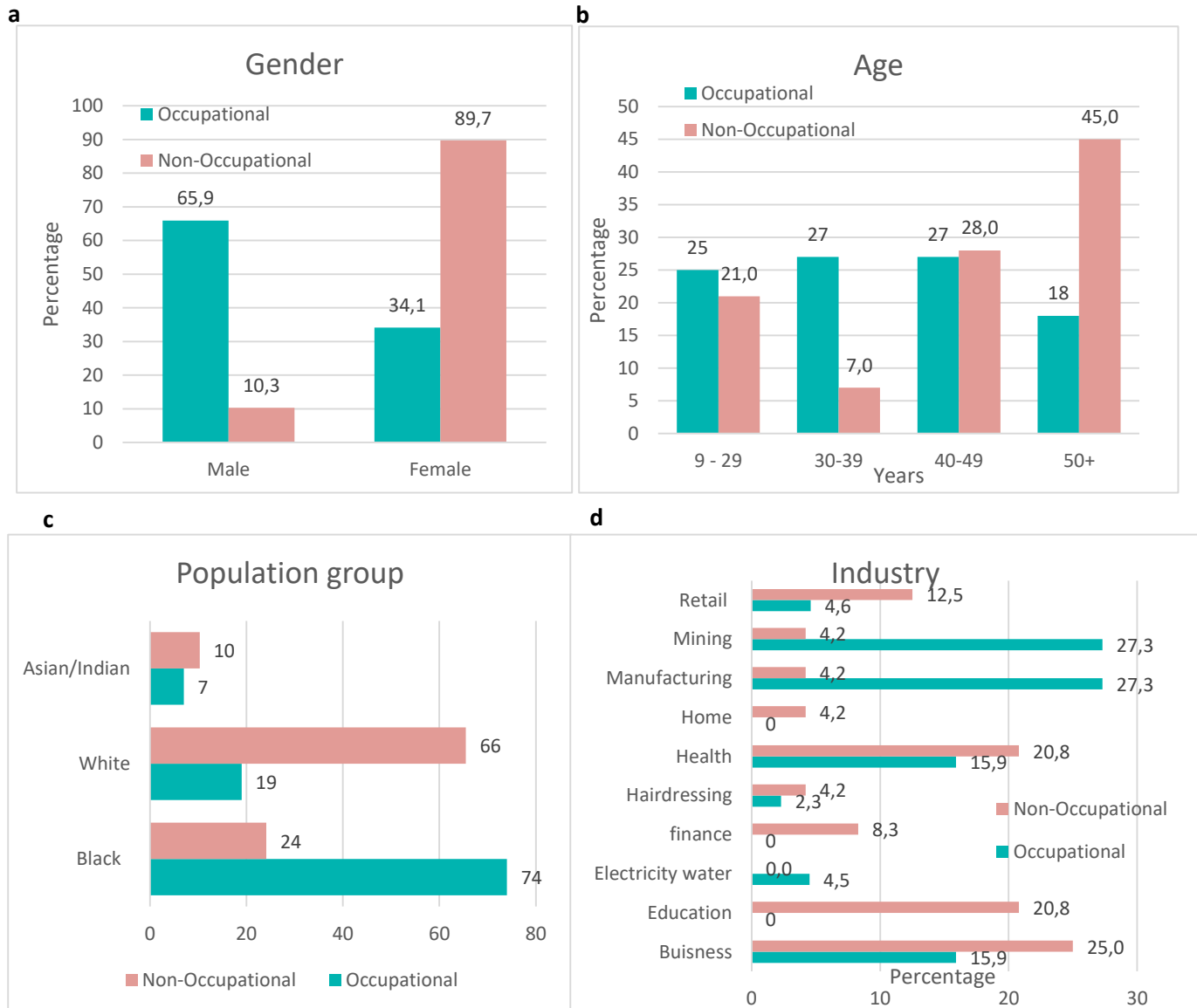


Figure 1 a-d Socio-demographics

The mean age of patients, attending the OSDC was 41 years; while all of the occupational referrals were of working age, the N-O ranged from 9 to 71 years of age. Approximately 60% of the occupational patients were male, while 86% of the N-O were female. OSDC attendees were Black 52% followed by White 38,4%. The majority of patients referred from workplaces were Black, while those referred by dermatologists (N-O) were White (Fig1c).

The main industries that referred patients were the manufacturing industry and the mining industry (27.3%), followed by health (15.9%) and business (15.9%). The N-O patients came from business (25%), health (21%) and education (16.1%) (Fig1d).

Figure 2 Occupational categories of referrals

Labourers in processing plants was the most common occupational category of all the referrals to the clinic, followed by medical practitioners & mining plant operatives.

## 5.2 Diagnosis of referred patients

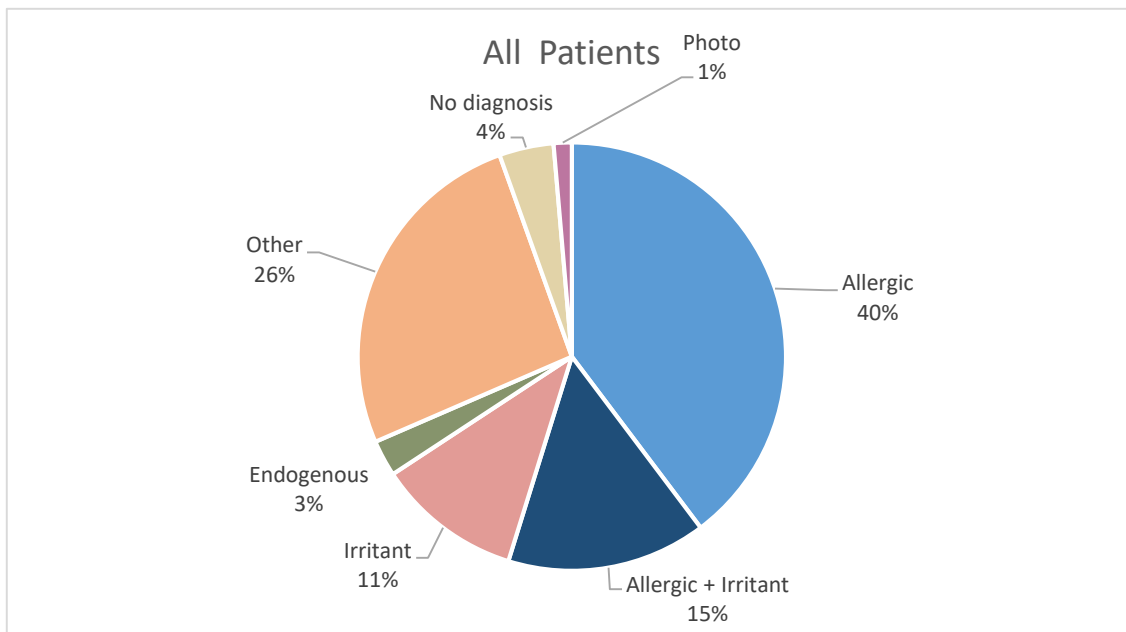


Figure 4. Percentage of all patients' main diagnosis.

Contact dermatitis (including allergic, irritant and a combination of both reactions) was diagnosed in the largest group of referrals (74%) (Fig2b). Followed by 'other', which included multiple chemical sensitivity, cancer and urticaria, among others.



### 5.3 Allergy screening diagnosis

The patients that attend the OSDC are seen by a dermatologist who diagnosis the type of OSD and if they are considered to have contact dermatitis, they are screened for possible allergic reactions by patch testing.

#### 5.3.1. Atopy

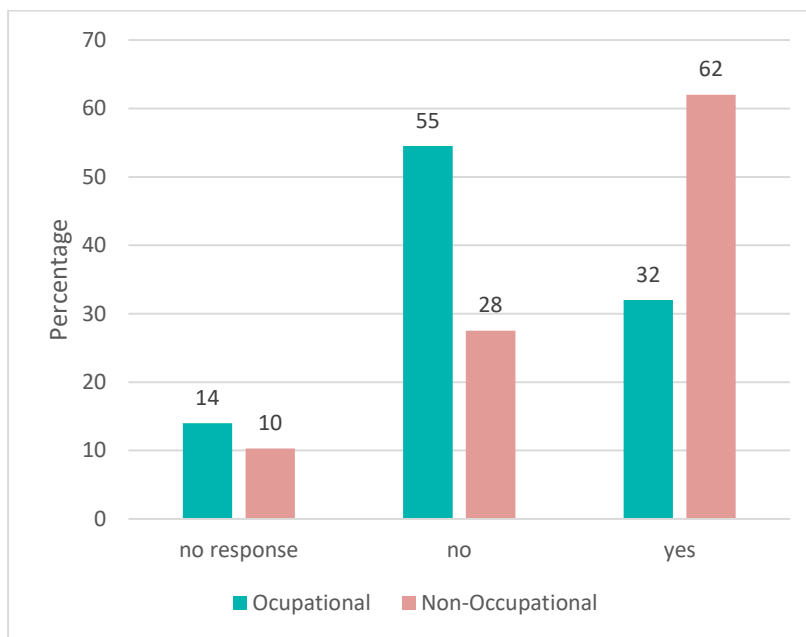


Figure 3 Percentage of patients reporting atopy.

Atopy was more prevalent among the N-O patients (62%) than the occupational patients (32%).

### 5.3.2 Allergy test series preformed

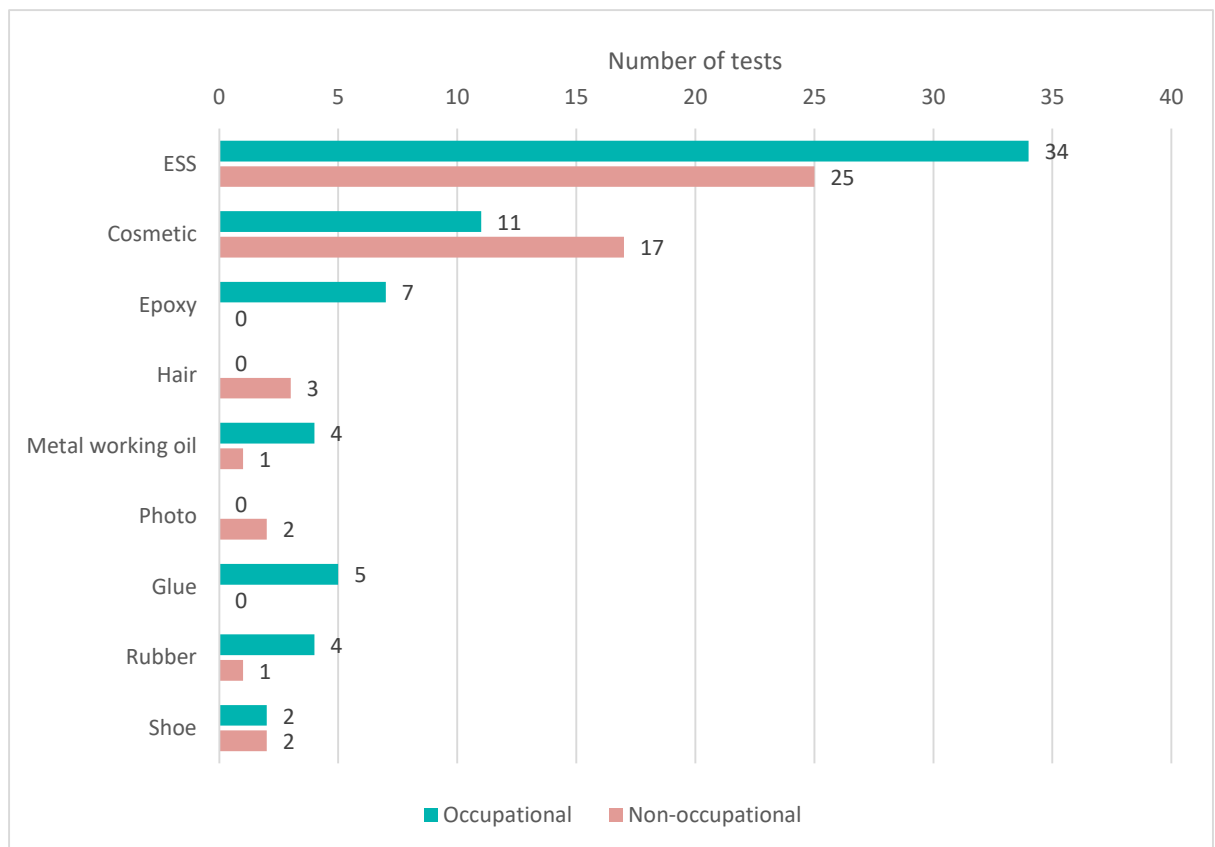


Figure 5 Number of allergy tests requested by patient group

#### 5.3.2.1 Patch test results of 2 most common series tested

##### 5.3.2.1.1 European standard series

The test series each consist of a number of allergens, 56% of those patients tested with the ESS were positive to at least one allergen in the test series.

Table 1 Number and percentage of patients testing positive for allergens in the ESS

Allergen Tested	OC (n positive)	OC%	N-O (n positives)	N-O%
Potassium dichromate	4	11,8	1	4,0
Thiuram	1	2,9	0	0,0
Paraphenylene diamine	1	2,9	1	4,0
Cobalt chloride	2	5,9	2	8,0
Formaldehyde	0	0,0	1	4,0
Colophonium	1	2,9	1	4,0
Balsam of Peru	3	8,8	4	16,0

Isopropyl phenyl phenylenediamine	0	0,0	1	4,0
Wool alcohol	1	2,9	0	0,0
Mercapto mix	1	2,9	0	0,0
Epoxy resin	2	5,9	0	0,0
Paraben mix	0	0,0	1	4,0
Fragrance mix I	1	2,9	4	16,0
Quaternium 15	1	2,9	1	4,0
Nickel sulphate	6	17,6	7	28,0
Methylchloroisothiazolinone/ Methylisothiazolinone (MCI/MI)	1	2,9	3	12,0
Mercaptobenzothiazole	1	2,9	0	0,0
Methylisothiazolinone	4	11,8	4	16,0
Budesonide	0	0,0	1	4,0
Methyldibromoglutaronitrile	1	2,9	1	4,0
Lyrall	2	5,9	1	4,0
Fragrance mix II	2	5,9	2	8,0

Of all patients tested with the ESS -nickel, methylisothiazolinone, Balsam of Peru, cobalt chloride and Fragrance mix II were common allergens detected among both groups whereas potassium dichromate and epoxy resin were common among the OC group and MCI/MI and fragrance mix I were common among the N-O Cosmetic series

#### 5.3.2.1.2 Cosmetic series

Six patients were tested with the entire cosmetic series and the positive reactions which were detected were:

Table 2 Positive reactions detected to allergens in the cosmetic series.

Positive reactions to allergens in Cosmetic series	No of positives
<u>Phenoxyethanol</u>	<u>1</u>
<u>Tea Tree Oil</u>	<u>1</u>
<u>Thimerosal</u>	<u>1</u>
<u>Hydroabietyl alcohol</u>	<u>2</u>
<u>tert-Butylhydroquinone</u>	<u>1</u>
<u>Cocamidopropyl betaine</u>	<u>1</u>

A total of 50% of patients tested (all N-O) reacted to at least one allergen from the cosmetic series and one of the patients tested positive to 3 allergens. Although these allergens were detected in N-O cases, they can also be of importance in an occupational setting. Phenoxyethanol & Thimerosal are preservatives commonly used in cooling fluids and hydroabietyl alcohol is used in sealants, adhesives and as a plasticizer in plastics.

## 5.4 Primary site affected by allergy

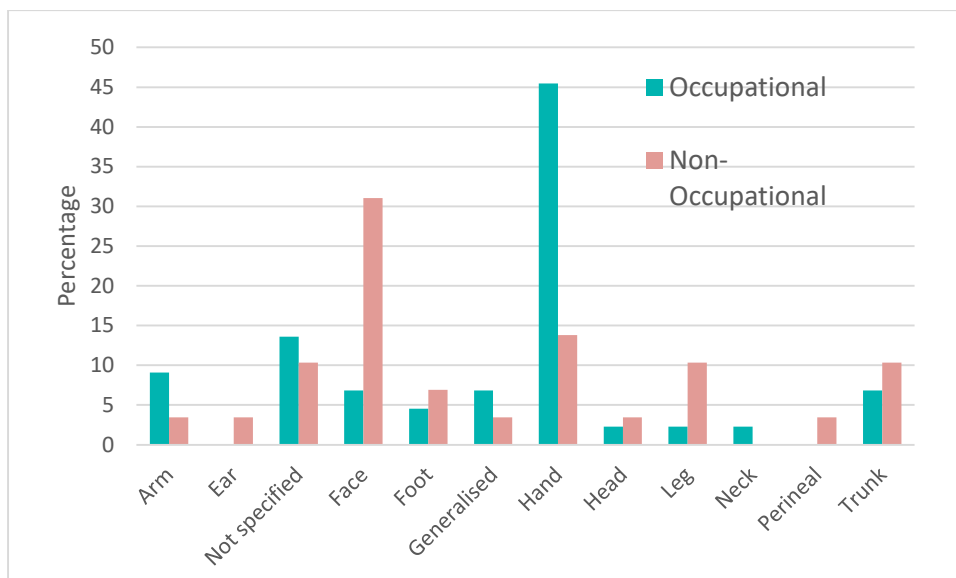


Figure 6 Percentage of patients and primary site of allergy.

The primary allergy site corresponds with the expected exposures, with N-O presenting with facial allergies and thus being tested for cosmetic products, while occupational referrals present with hands as primary sites of allergy (Fig 8).

## 5.5 Workplace related

The skin diseases were considered to be workplace related if they occurred while at work, with an improvement when away from work and a recurrence when returning to work. Also if there are exposures to possible causative agents in the workplace. Seventy-seven percent of the occupational referrals were diagnosed as having an occupational or work-related skin disease.

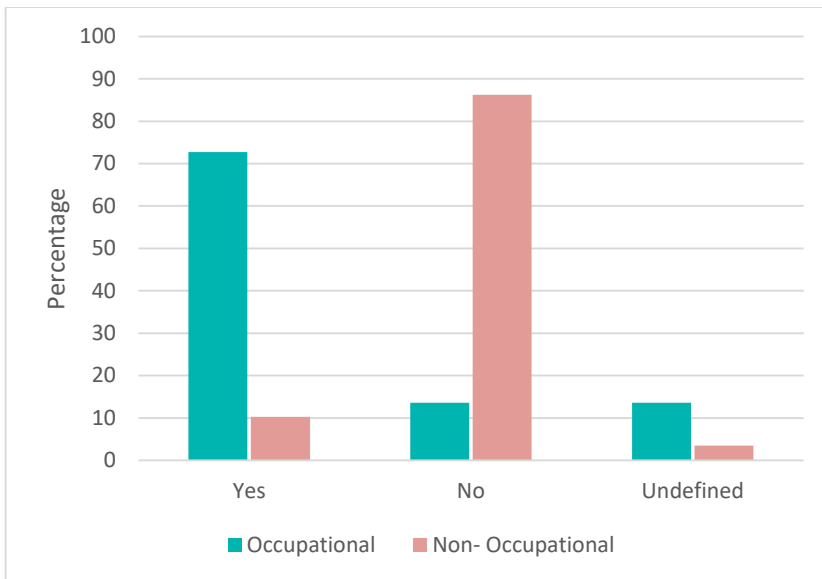


Figure 7 Percentage of work related allergies by patient type

## 6 Conclusions

Occupational contact dermatitis, both allergic and irritant form an important part of Occupational Health Surveillance of these diseases is an essential component of an occupational health surveillance programme, which helps with control and planning. Awareness is needed amongst workers and management of the risk of developing workplace contact dermatitis.

In 2018, a significant percentage of workers had work related allergies and the majority of patients were from the manufacturing, mining and health, highlighting the need for more research and implementation of control measures in these industries. Strengthening the skin surveillance programme in these industries and in South Africa could provide a comprehensive picture, but for this to occur, additional data is needed from other allergy treatment centres throughout the country.

## 7 Limitations

Majority of the patients are from Gauteng due to the location of the clinic in Johannesburg, Gauteng. Thus these results cannot be generalised. Other centres assessing occupational skin diseases (public and private) need to provide data to develop a comprehensive occupational skin surveillance system.

There is missing data/information in the current data collection tool. Although the data for occupation of referrals are available they are not necessarily appropriate to the SA situation. The province of employment is unavailable. These and other relevant information will be added to the minimum data set for future surveillance.