

## WHAT FACTORS CONTRIBUTE TO A HIGHER FREQUENCY OF SKIN INFECTIONS AMONG ADULTS IN MAURITIUS?

Kotowaroo Goonmatee, Jeewon Rajesh

*Department of Health Sciences, Faculty of Science, Reduit, University of Mauritius, Mauritius*

Source of Support:  
Nil

Competing Interests:  
None

Corresponding author: Dr Jeewon Rajesh PhD.

[r.jeewon@uom.ac.mu](mailto:r.jeewon@uom.ac.mu)

Our Dermatol Online. 2013; 4(3): 297-302

Date of submission: 22.04.2013 / acceptance: 27.05.2013

### Abstract

**Introduction:** Given the rise in the prevalence of skin infections in many countries and the lack of published data pertaining to the prevalence and awareness of skin infection in Mauritius, this survey is the first of its kind to provide data on this issue. The aim of this study is to describe the association of skin infection with various predisposing factors such as socioeconomic status, personal hygiene and level of awareness and to assess the impact of skin infections on quality of life.

**Material and Methods:** A stratified sample of 500 adults was randomly selected for this study. Subjects were administered a questionnaire to elicit information on sociodemographic factors, awareness, family history and prevalence of skin infections. Quality of life was investigated by a validated questionnaire (DLQI). SPSS Software and Microsoft Excel were used to analyse data.

**Results:** Among 500 participants, 166 (33%) cases of skin infections were obtained. Acne was found to be more prevalent (n=59). It was found that skin infection varies with gender and higher prevalence was observed during summer as compared to winter ( $p=0.017$ ). It was noted that family history and income level were associated with an increase incidence of skin infection ( $p=0.000$ ). With respect to quality of life, psychological distress was mostly affected.

**Conclusion:** Acne was found to be more prevalent. Respondents with middle income status were mostly affected with skin infection. Those with a family history were more prone to skin infection. The Quality of Life index was found to be an efficient method in assessing the impact of skin infection on the respondents' lives.

**Key words:** skin infection; prevalence; adults; awareness; personal hygiene; quality of life

### Cite this article:

Kotowaroo Goonmatee, Jeewon Rajesh: What factors contribute to a higher frequency of skin infections among adults in Mauritius? *Our Dermatol Online*. 2013; 4(3): 297-302

### Introduction

Several studies have been done worldwide to find the prevalence of skin infections and to assess the level of awareness among adults. In developing countries, the published figures for the prevalence of skin infection range from 20 to 80% [1]. Data from the latest report in Mauritius clearly demonstrate that the rate of skin infection has known an increase from year 2010 to year 2011 [2]. In year 2010, out of 14 048 cases, treated at the dermatology specialist clinics, highest percentage of skin infections were of fungal origin (12.4%) and the lowest percentage of (3.6%) were of bacterial sources as compared to the year 2011, where 12.7% of skin infections were of fungal origin and 3.4% of bacterial origin [2].

Numerous factors can contribute to the development of skin infection such as: poor skin health, low socioeconomic status, low level of hygiene, overcrowding and also lack of awareness [3-6]. In Tigray (Northern Ethiopia), eczema was most common and acne the least common among the outpatient attendance and a positive correlation between these skin infections with factors

such as overcrowding, poor hygiene and low socioeconomic status was reported [7]. In Sierra Leone, Bari [8] demonstrated that skin infections was prevalent (42 %) in African population due to the environmental and social factors and most importantly due to the geographical factors such as climate and season. Similarly, Souissi et al [9], reported a high prevalence of fungal infection (16.9%) and eczema (11.9%) in Tunis which was associated to the climatic conditions prevailing there.

Poor socioeconomic status has been identified as the main root of skin infection in developing countries and Tinea versicolor was found to be the most common fungal skin infection in Nigeria [10]. The predisposing factors to this infection were heavy sweating, warm and humid environment, malnutrition and genetics. Moreover it was found that the treatment for these infections is quite expensive and the infected population with a low socioeconomic status cannot afford these costly treatment and this results in a high number of respondents with skin infections [10].

Schofield et al [11] demonstrated that skin diseases have a negative impact on quality of life. Knowledge is an essential prevention factor but however, data pertaining to knowledge of skin infection among adults are inadequate. This research will serve as baseline information that could be related with upcoming follow-up studies.

This study has been designed to assess the level of awareness of skin infections and to determine the prevalence of these skin infections among the Mauritian population and also to describe their association with various predisposing factors such climatic condition, level of education and socioeconomic status. The main objectives of this study are as follows:

1. To investigate the prevalence of skin infection in relation to age, level of hygiene, family history and socioeconomic status.
2. To investigate for any link between the socioeconomic status and awareness with the occurrence of skin infections.
3. To determine which skin problems are most prevalent and if there are gender differences.
4. To assess the impact of skin infection on quality of life.

## Material and Methods

### Study Population

A stratified sample of 500 adults was randomly selected for this study in 2012. Foreigners and pregnant women were excluded. The participants were well informed about their involvement in the survey with proper informed consent. They were explained about their voluntary participation and all the information gathered would be dealt in strict confidentiality and the findings would be used for research purposes only. This research was approved by the Research Ethics Committee.

### Assessment

#### Questionnaire Design

Two questionnaires were used: one questionnaire which consisted mostly of close ended questions was designed to retrieve information such as:

a) *Sociodemographic factors*: Data collected included sociodemographic details such as gender, age group, occupation,

level of education, climatic condition, number of general household members and the total family income status [3,5]. Household Income categories were classified as follows [12]: i) Low Income : Less than Rs 15 000 (< 500 USD), ii) Middle Income : Rs 15 000- Rs 30 000 (500-1000 USD) and iii) High Income: Above Rs 30 000 (> 1000 USD)

b) *Awareness*: Questions on type of skin infections were asked together with the risk factors associated with skin infections.

c) *Personal Hygiene*: This section consists of questions such as frequency of shower, sharing of their personal belongings and the associated risk factors [5].

d) *Family History*: Questions were asked on whether there exist any family history of skin infection as some skin condition were due to family history [13,14].

The second questionnaire dealt with e) Quality of Life: Skin infections can have a serious impact on the psychological well being, social and everyday activities on the patient and the patient's family [11]. A validated questionnaire obtained from the Dermatology Life Quality Index (DLQI) has been adapted and used [15].

### Statistical Analyses

The Statistical Package for Social Scientist (SPSS statistical package version 20.0) was used for the statistical analyses together with Microsoft Excel 2007. The data were analysed with frequencies, cross tabs, Pearson correlation and chi square test.

### Results

Table I shows the sociodemographic details of the respondents. Out of 500 participants, 273 (55%) were male and 227 (45%) were female. The mean age group of the participants were between 26-40 years old (41%).

The majority of respondents [259 participants (52%)] were from a middle socioeconomic status with a middle income of Rs 15 000 - Rs 20 000 (500-1000 USD). The highest level of education for most participants were tertiary level [n= 244 (49%)].

		Frequency	Percentage (%)
<b>Gender</b>	Male	273	55
	Female	227	45
<b>Age Group</b>	18-25	111	22
	26-40	204	41
	41-60	149	30
	Above 60 years	36	7
<b>Household Income Status</b>	Below Rs 15 000 (Below 500 USD)	49	10
	Rs 15 000- Rs 30 000 (500 USD-1000 USD)	259	52
	Above Rs 30 000 (Above 1000 USD)	192	38
<b>Highest Level of Education</b>	Primary	41	8
	Secondary	215	43
		244	49

Table I. The sociodemographic details of the participants

**Prevalence of skin infection**

Among 500 participants, 166 (33%) cases of skin infections were determined in this study. Acne was found to be more prevalent (n=59) followed by eczema (n=33), versicolor infection (n=30), athlete's foot (n=26) and ringworm infection (n=12). Only 4 cases of wart and 2 cases of psoriasis have been reported (Tabl. I).

With relevance to gender, it can be seen that there is almost the same ratio of female (n=85) to male (n=81) who are affected with skin infection (Tabl. II). However, it can be seen that in some skin infections, females are more affected than male. For instance for acne, 58% are females as compared to males (12 %).

Results also reveal that approximately the same frequency of infections can be seen in the age groups 18-25 and 26-40 years

old. Figure 1 shows that acne and athlete foot are more prevalent in the age group of 18-25. The age group 41-60 years old are mostly affected with versicolor infection while the elderly age group (above 60 years old) are more affected with eczema.

A statistical significant relationship was obtained between skin infection and seasonal variation (*p* value of 0.017). Highest percentage of infections (79%) was observed to be most common in summer season. Summer season correlated with the occurrence of skin infections, hereby showing that seasonal variation has an effect on skin infection. 52% cases of past/current skin infection have been linked to a positive family history of skin infection (*p* value = 0.000), and data indicate that skin infections are recurrent in respondents in which there is a past family history of skin infection.

	Skin Infection							Total
	Acne	Eczema	Athlete's Foot	Versicolor Infection	Ringworm Infection	Wart	Psoriasis	
Male	10	19	16	21	10	3	2	81
Female	49	14	10	9	2	1	0	85
Total	59	33	26	30	12	4	2	166

Table II. The distribution of skin infections in both genders

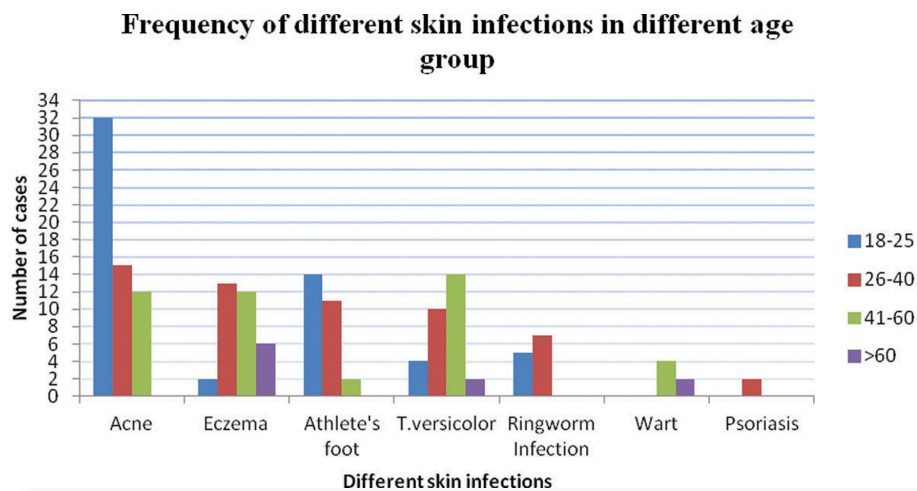


Figure 1. Frequency of skin infection in different age groups

**Awareness on skin infection**

423 participants (85%) are aware on skin infection. A high frequency of participants are highly aware of skin infection (n=423,85%) and the highest number of participants (n=208,42 %) were from middle socioeconomic status followed by 178 participants (36%) from a high socioeconomic status. Only a minority of the respondents reported no knowledge and awareness on skin infection (n=77,15%). Results obtained also indicate that there is a high number of respondent who reported having good knowledge on skin infection and they were mainly those who had tertiary education (n=234). Participants with a primary education level were those with least knowledge about skin infection (n=25). Data demonstrate that most of the respondents who reported having a good knowledge on

skin infection also had good hygiene practices and are highly aware of the risk factors associated with skin infection (Fig. 2). For instance, 73% of respondents knew that use and sharing of cosmetics is a risk factor. In addition, 95% reported that they change their clothes after heavy sweating and 78% of respondents were aware that sharing of personal belonging is a risk factor.

**Quality Of Life**

The most frequently described aspect was psychological distress due to itchy and painful skin (n=110) and embarrassment (n=100) (Fig. 3). Moreover the burden of the skin infection affected activities such as shopping (n=71) and created problems with partner and closed friends/relatives (n=62).

The problems caused due to people's reaction to the patient's skin appearance lead to an influence on the respondents clothes

(n=52). It also affected the social life, work and academic performance of the respondents.

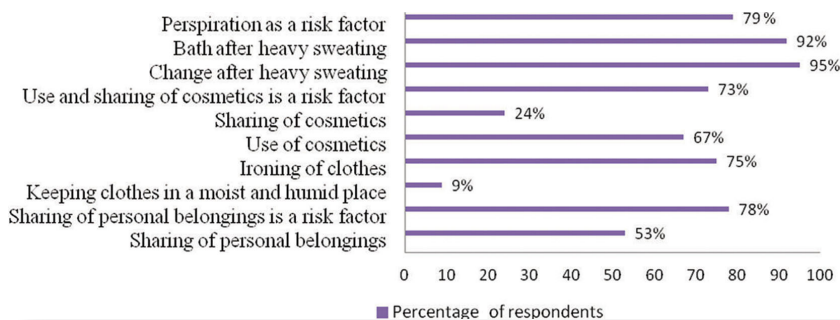


Figure 2. Respondent's awareness on hygiene practices as risk factors for skin infections

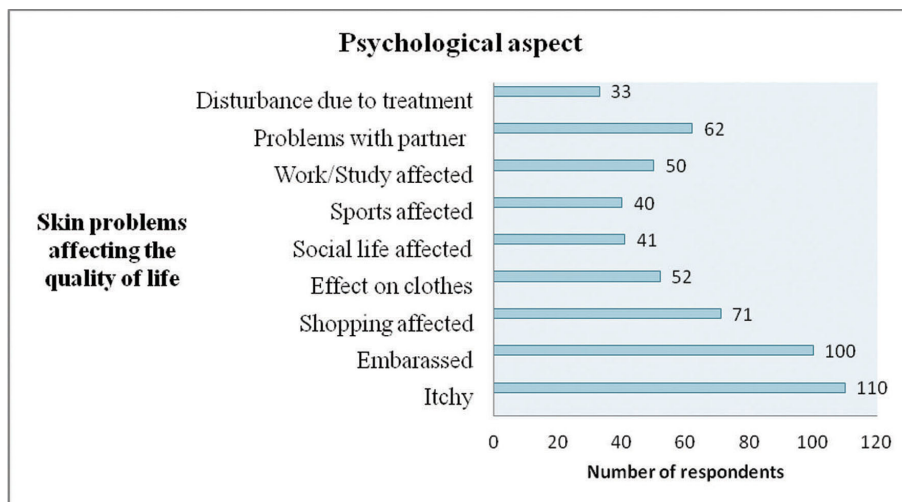


Figure 3. Psychological aspect of skin infection

## Discussion

### Prevalence of skin infections

Current results demonstrate one third of the respondents (33 %) had skin infection. This result is similar with that of the Mauritian Health Statistics Report 2010, whereby a prevalence of 32.5% of skin infections was observed [16]. This finding is also in line with the results of Hay et al [1] who reports that in developing countries, the published figures for the prevalence of skin infection range from 20 to 80%.

In this study, acne was found to be more prevalent, followed by eczema, athlete's foot, Tinea versicolor and the less common skin infections were ringworm infection, wart and psoriasis.

### Gender and skin infection

A major finding of this study was that the ratio of female to male affected with skin infection is almost the same (Tabl. II). However, females (58%) were more affected with acne than males (12%). Similar results were obtained by Khunger and Kumar [17] and Adityan and Thappa [18] in India who reported that females are more affected with acne. Contrasting results were reported by Akyasi et al. [19], who found that in Turkey, men are predominantly affected with acne than women. Although it has been reported that the incidence of Tinea versicolor is almost the same among male and female, findings herein suggest a totally different scenario. Male gender (20%) appears to be an important risk factor in versicolor infection compared to females (12%). These results are consistent with

several studies. For instance, Mahmoudabadi et al [20], Rasi et al [21] and He et al [22] found that more males were affected with versicolor infection than women in Iran and China respectively. However, among children, the most common dermatophyte infection is Tinea capitis [6].

### Age and skin infection

This study also reveals that age is a predominant factor contributing to a higher prevalence of skin infections. Highest rate of infections were observed in Mauritian adults aged between 18-25 years old and 26-40 years old (Fig. 1). Among the respondents, acne is highly prevalent in the age group 18-25 years old. This result was similar to that found in India by Khunger and Kumar [17] and Adityan and Thappa [18]. Tinea versicolor was more prevalent in the age group 41-60 years (Fig. 1). This result is totally different with the existing published literature. For example, it was reported that highest prevalence of Tinea versicolor infection was among 20-40 year old group and that this age group coincided with the age period when sebum production was highest [21,23]. Mahmoudabadi et al [20] reported the highest frequency were among the 17-28 years age group and suggested an association with hormonal changes and increased sebaceous gland activity. Results herein could not be associated with hormonal changes and sebum production as after the puberty age, sebum production wanes as the level of hormone decreases.

Eczema was more prevalent in the age group 26-40 years old (Fig. 1). This finding corroborate with that of Handa et al [24] who found the most affected age group to be between 21-40 years old and that of Lysdal et al [13] between 22-32 years old. In both gender, eczema was less likely to occur in respondents who were below the age group 26-40 years and above 60 years old. Similar results were reported by Handa et al [24] and this stems from the fact that elderly have several defects in the induction and elicitation of eczema and the younger ones may only have limited exposure to irritants and allergens.

#### **Seasonal variation**

Another major factor contributing positively to a higher incidence of skin infection in this current study is seasonal variation [32]. It is generally known that season does have an impact on skin infection. Highest percentage of infections (79%) was observed to be most common in summer season, hereby showing that seasonal variation has an effect on skin infection. For instance, Adityan and Thappa [18] reported that seasonal variation had an effect on acne and Khunger and Kumar [17] reported that a hot climate and summer aggravated acne. All these findings were in line with this current study. In the case of versicolor infection, He et al [22] stated that climate has the greatest impact on appearance, spread and relapse of *Tinea versicolor*. Athlete's foot was the third most prevalent skin infection. This could be explained by the dry climatic conditions prevailing as *Trichophyton* species, causing agent of Athlete's foot, thrives in a warm and moist environment [25]. The findings are in line with what have been found by Asadi et al. [26] and Cohen et al [27] that the prevalence of *tinea pedis* is higher in hot climate and is more prevalent in tropical countries as in Mauritius.

#### **Family history**

A positive correlation was established between family history and skin infections (52%). The present study demonstrates that those having a family member with skin infection had a higher risk and some even had the same infection (for example acne and eczema). Luk et al. [28] also reported a significant relationship between family history of atopy and eczema, indicating a correlation between positive family history and eczema [33]. Similarly, He et al [22] observed that in respondents with a positive family history of *Tinea versicolor*, infection was recurrent and it lasted longer than in those with a negative family history.

#### **Awareness of skin infection and proper hygiene**

Data obtained from this study indicated 85% of the respondents have a good knowledge and awareness on skin infection.

#### **Socioeconomic class, level of education and personal hygiene**

Results from this present study revealed that majority of respondents who were from the middle household income and tertiary education, had a good knowledge and are aware of skin infection. Lowest level of awareness was indicated among low socioeconomic status who were educated only up to primary education level.

Another key point in this study is that most of the respondents who are knowledgeable on skin infection practiced good hygiene and are aware on risk factors of skin infection (Fig. 3) [34]. Cosmetics can influence the balance of micro flora in the skin [29]. In Sweden, Berne et al [30] revealed that the use of cosmetics is rising and adverse reactions to these products

are increasing. In the present study, it was found that 73% of respondents knew that use and sharing of cosmetics is a risk factor (Fig. 3). In addition, more than 90% of respondents reported that they bath and change their clothes after heavy sweating which are good hygiene practices and also 78% of participants were aware that sharing of personal belongings is a risk factor (Fig. 3) [34].

Only 9% of the participants kept their clothes on a humid and moist environment and this shows that the participants were aware that keeping their clothes in such environment would favour fungal growth and in turn this could be a predisposing factor for fungal infection. This was further supported by the fact that 75% of the participants ironed their clothes in order to get rid of any fungal growth on their clothes either humid or dry.

#### **Quality of life**

Skin infection can have an impact on respondents' lives and several validated patient-completed questionnaire have been used to assess its impact [31]. In comparison to other studies, Schofield et al [11] observed that skin infections have a serious negative impact on the quality of life. Further analyses do provide further evidence that there are other minor ways in which quality of life due to skin infection are affected [32]. The most commonly reported quality of life was psychological distress due to itchy, painful and stinging skin (n=110) and embarrassment (n=100) (Fig. 4). Moreover the burden of the skin infection affected leisure activities such as shopping (n=71) and created problems with partner and closed friends/relatives (n=62). The lives of some respondents with skin infection are severely affected and in turn the family life of caregivers that are involved with the respondents also are affected. The problems caused due to people's reaction to the respondent's skin appearance, lead to an influence on the respondents clothes (n=52). It also affected the social life, work and academic performance of the respondents.

#### **Conclusion**

This study reveals that one third of the studied Mauritian population has been affected with skin infection with acne being the most prevalent skin infection followed by eczema, athlete foot and versicolor infection. A higher prevalence of skin infections correlated with several factors such as age, gender, personal hygiene, level of awareness and climatic conditions. Age is a key factor in the occurrence of specific skin infections especially for acne and eczema.

Mauritian population have a good knowledge on the awareness of skin infection and had good hygiene practices and were highly aware on the risk factors associated with skin infection. The Quality of Life index was found to be an efficient method in assessing the impact of skin infection on the respondents' lives. The most commonly reported quality of life was psychological distress and embarrassment. The burden of skin infection remained an issue as it affected the social life of the respondents and created problems with families, friends, partners and relatives.

#### **Acknowledgement**

I would like to thank the Department of Health Sciences (University of Mauritius) for supporting this project. I am deeply grateful to all the respondents, who have been very patient and cooperative in answering all the required questions for the purpose of the study.

## REFERENCES

1. Hay R, Bendeck SE, Chen S, Estrada R, Haddix A, Mcleod T, et al: Skin Disease. In: D.T. Jamison, J.G. Breman, A.R. Measham, 2nd Ed. Disease Control Priorities In Developing Countries. Washington: World Bank, 2006: 707-721. Available From: [Http://www.Ncbi.Nlm.Nih.Gov/Books/Nbk11733/](http://www.ncbi.nlm.nih.gov/books/Nbk11733/) [Accessed November 15,2012]
2. Ministry Of Health And Quality Of Life : Health Statistics Report 2011. Health Statistics Unit. 2011. 69.
3. Bpac: Skin Infection In Pacific Peoples. New Zealand: Bpj. 2010;32:23-8.
4. World Health Organisation (WHO): Growing Awareness Of Skin Disease Starts Flurry Of Initiatives. Geneva: WHO. 2005;83:881-968.
5. Balai M, Khare AK, Gupta LK, Mittal A, Kuldeep CM: Pattern Of Pediatric Dermatoses In A Tertiary Care Centre Of South West Rajasthan. *Indian J Dermatol.* 2012;57:275-8.
6. Puri N, Puri A: A study on tinea capitis in the preschool and school going children. *Our Dermatol Online.* 2013;4:157-60.
7. Accorsi S, Barnabas GA, Farese P, Padovese V, Terranova M, Racalbutto V, et al: Skin Disorders And Disease Profile Of Poverty: Analysis Of Medical Records In Tigray, Northern Ethiopia, 2005-2007. *Trans R Soc Trop Med.* 2009;103:469-75.
8. Bari A: Pattern Of Skin Infections In Black Africans Of Sierra Leone. *Indian J Dermatol.* 2007;5:30-4.
9. Souissi A, Zeglaoui F, El Fekih N, Fazaa B, Zouari B, Kamoun MR: Skin Diseases In The Elderly: A Multicentre Tunisian Study. *Ann Dermatol Venereol.* 2006;133:231-4.
10. Oladele AT, Dairo BA, Elujoba AA, Oyelami AO: Management Of Superficial Fungal Infection With Senna Alata ("Alata") Soap: A Preliminary Report. *Afr J Pharmacy Pharmacol.* 2010;4:98-103.
11. Schofield J, Grindlay D, Williams H: Skin Conditions in The Uk: A Health Care Needs Assessment. 1st Ed. Uk: Centre Of Evidence Based Dermatology. 2009: abstract.
12. Central Statistics Office (CSO) : Ministry Of Finance & Economic Development 2010: Mauritius In Figures. Central Statistics Office, Government Of Mauritius. 2010:1-47.
13. Lysdal SH, Sosted H, Andersen KE, Johansen JD: Hand Eczema In Hairdressers: A Danish Register-Based Study of the Prevalence of Hand Eczema and its Career Consequences. *Contact Dermatitis.* 2011;65:151-8.
14. National Society For Eczema: What Is Eczema?: National Eczema Society. London. 2012. Available From: [Http://www.Eczema.Org/What-Is-Eczema](http://www.Eczema.Org/What-Is-Eczema) [Accessed January 20, 2013]
15. Finlay AY, Khan GK: Dermatology Life Quality Index. 1992. Available From: <http://www.Dermatology.Org.Uk/Quality/Dlqi/Quality-Dlqi-Questionnaire.Html> [Accessed November 06, 2012]
16. Ministry Of Health And Quality Of Life: Health Statistics Report 2010. Health Statistics Unit 2010.64-9.
17. Khunger N, Kumar C: A Clinico-Epidemiological Study Of Adult Acne: Is It Different From Adolescent Acne? *Indian J Dermatol Venereol Leprol.* 2012;78:335-41.
18. Adityan B, Thappa DM: Profile Of Acne Vulgaris-A Hospital-Based Study From South India. *Indian J Dermatol Venereol Leprol.* 2009;75:272-8.
19. Akyazi, H, Baltaci D, Alpay K, Hocaoglu C: Quality Of Life In Adult Respondents With Acne Vulgaris Before And After Treatment. *Dicle Med J.* 2011;38:282-8.
20. Mahmoudabadi AL, Mossavi Z, Zarrin M: Pityriasis Versicolour In Ahvaz, Iran. *Jundishapur J Microbiol.* 2009;2:92-6.
21. Rasi A, Naderi R., Behzadi AH, Falahati M, Farehyar S, Honarbakhsh Y, et al: Malassezia Yeast Species Isolated From Iranian Respondents With Pityriasis Versicolor In A Prospective Study. *Mycoses.* 2009;53:350-5.
22. He SM, Du WD, Yang S, Zhou SM, Li W, Wang J et, al: The Genetic Epidemiology of Tinea Versicolor in China. *Mycoses.* 2007;51:55-62.
23. Brzezinski P, Kaczmarek D: Malassezia folliculitis on the neck. *N Dermatol Online.* 2010;1:22-5.
24. Handa S, Kaur I, Gupta T, Jindal R: Hand Eczema: Correlation Of Morphologic Patterns, Atopy, Contact Sensitization And Disease Severity. *Indian J Dermatol Venereol Leprol.* 2012;78:153-8.
25. Gould D: Diagnosis, Prevention And Treatment Of Fungal Infections. *Nursing Standard.* 2011;25:38-47.
26. Asadi MA, Dehghani R, Sharif MR: Epidemiologic Study Of Onychomycosis And Tinea Pedis In Kashan,Iran. *Jundishapur J Microbiol.* 2009;2:61-4.
27. Cohen AD, Wolak A, Alkan M, Shalev R, Vardy DA: Prevalence And Risk Factors For Tinea Pedis In Israeli Soldiers. *Int J Dermatol.* 2005;44:1002-5.
28. Luk N- MT, Lee H-CS, Luk C-KD, Cheung Y-YA, Chang M-C, Chao V-KD, et al: Hand Eczema Among Hong Kong Nurses: A Self Report Questionnaire Survey Conducted In A Regional Hospital. *Contact Dermatitis.* 2011;65:329-35.
29. Holland KT, Bojar RA: What Is Their Influence On The Skin Microflora? *Am J Clin Dermatol.* 2002;3:445-448.
- 30) Berne B, Tammela M, Farm G, Inerot A, Linberg A: Can the Reporting of Adverse Skin Reactions to Cosmetics be Improved? A Prospective Clinical Study Using a Structural Protocol. *Contact Dermatitis.* 2008;58:223-7.
31. Basra MKA, Sue-Ho R, Finlay AY: The Family Dermatology Life Quality Index: Measuring The Secondary Impact Of Skin Diseases. *Br J Dermatol.* 2006;156:528-38.
32. Laniauskaite L, Ožalinskaite A, Strupaite R, Bylaite M: Skin cancer knowledge, attitude and behavior towards sun exposure among young adults in Lithuania. *Our Dermatol Online.* 2011;2:189-95.
33. Nwabudike LC: Atopic dermatitis and homeopathy. *Our Dermatol Online.* 2012;3:217-20.
34. Wollina U, Nowak A: Dermatology in the Intensive Care Unit. *Our Dermatol Online.* 2012;3:298-303.