# THE EFFECT OF FREQUENTLY WEARING FACE MASKS DURING THE COVID- 19 PANDEMIC ON THE DEVELOPMENT OF ACNE IN ADULTS: A CROSSSECTIONAL DESCRIPTIVE STUDY

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# THE EFFECT OF FREQUENTLY WEARING FACE MASKS DURING THE COVID- 19 PANDEMIC ON THE DEVELOPMENT OF ACNE IN ADULTS: A CROSSSECTIONAL DESCRIPTIVE STUDY

## Abstract

The aim was to highlight the dermatological side effect "acne" of repetitive usage of face masks on the skin of adults living in Lebanon through a cross sectional descriptive study involving self-administered questionnaire. Following ethical and administration approval, the questionnaire in English language was generated on a link through Google forms. The link was disseminated through social media; Facebook, Instagram and to the WhatsApp groups of the research group who are nursing BS students at the Faculty of Health Sciences. A total of 305 completed the questionnaire. Data analysis was done via SPSS. The mean age of the study participants was 22.62 years (SD=6.29). The majority (n=218, 71.5%) were female and a large number (n=203, 66.6%) were students living in Beirut (n=172, 56.4%). Skin characteristics were changed significantly after wearing a mask for a long period of time. Maskne developed after routinely wearing a mask for at least five hours daily. Other factors that increased the risk of developing Maskne included female gender, gastrointestinal problems, using hydrating facial products, having an oily or sensitive skin, oral contraceptives use, stress, history of acne, and hot weather. The majority graded their acne as mild and experienced redness and oiliness underneath their masks. The study identified the association between wearing facemasks and acne development during the covid-19 pandemic. Wearing a mask during this pandemic is definitely necessary but expected skin changes can be avoided and skin health can be preserved with the appropriate measures. Additional studies are needed to better understand how to manage mask-related acne development and inform clinical decision-making.

## Keywords

Acne, Maskne, COVID-19 pandemic, Facemasks.

## Authors

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## 1. INTRODUCTION

An unexpected virus emerged December 2019 originating from Wuhan, a city located in Central China in Hubei province (Singhal, 2020). The coronavirus (SARS-CoV-2) spread globally causing international concern and affected the lives of millions globally (McKibbin & Fernando, 2020). The outbreak was confirmed a public health emergency in January 2020, and a pandemic in March 2020 (Lv et al., 2020). Coronavirus disease (COVID-19) is a communicable airborne disease that spreads primarily through droplets of saliva or discharge from the nose through coughing or sneezing (Stanam, Chaudhari, & Rayudu, 2020). In attempts to control the transmission, a list of temporary recommendations was issued by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) (Lv et al., 2020). These recommendations included frequent hand washing with soap and water or with alcohol-based hand rubs, disinfecting surfaces, social distancing, and wearing personal protective equipment (PPEs) (Techasatian et al., 2020).

Some of these PPEs include face shields, goggles, gloves, gowns and respirators or face masks (Rosner, 2020). There are many types of masks that provide different levels of protection, these include disposable surgical masks, reusable masks, and N-95 masks or respirators (Naqvi et al., 2020). Although masks play a huge role in protecting from the virus, they have many side effects. These side effects include respiratory problems, discomfort, headaches, distress, dehydration, exhaustion, and skin breakdown and acne (Martin, Hanna, & Dingwall, 2020). Acne is a condition that occurs when the pore in the skin is blocked due to excess oil production, dirt, dead skin cells, or bacteria leaving papules, pustules, nodules, or cystic lesions on the skin (Ramos-e-Silva & Carneiro, 2009). Since wearing a face mask has become the new ordinary, dermatological concern was raised regarding prolonged face mask use and its effect on the skin underneath (Foo, Goon, Leow, & Goh, 2006). The informal term "Maskne" was raised referring to acne caused by humidity, higher temperature, pressure, friction on the skin's surface under the mask (Harrell & Allen, 2020). Reporting the incidence of skin breakdown and acne in a community setting that is obliged to wear these masks as a precautionary measure against the COVID -19 is necessary.

Routinely wearing facemasks was shown to be linked to developing skin breakdown in many studies. A prospective study conducted on 833 participants where more than half (54.5%) had adverse skin reactions secondary to facemasks. The most reported skin reactions were acne (39.9%) followed by skin rash (18.4%) and itching (15.6%) (Techasatian et al., 2020). On the other hand, another study was conducted during the COVID-19 pandemic on 2315 Polish students aged between 18 and 27 years. Only 1,393 out of 2,307 stated that they had used masks during the last week and only 19.6% complained of itch in their faces. Almost 60% of those who reported itch were using 3-layered surgical masks, 65.6% were using cloth masks, 22% were using respirators (N95+FFP), 3% were using half-face elastomeric respirator, and 1.8% were using full-face respirator (Szepietowski, Matusiak, Szepietowska, Krajewski, & Białynicki-Birula, 2020).

When evaluating the severity of acne with wearing facemasks, a study was conducted on a sample of individuals diagnosed with having acne vulgaris and rosacea. The sample consisted of 30 participants with a median age of 34 years. The assessment was done by dermatological discussions through phone calls. The participants reported wearing a mask for a median of 8 hours per day where this number of hours (Damiani et al., 2021).

### 1.1 Factors Influencing the Development of Maskne

The development of skin reaction was shown to be linked to multiple factors. Chaiyabutr, Sukakul, Pruksaeakanan, and Thumrongtharadol Waranya Boonchai (2020) reported that Maskne was linked to the type of skin where 21% of those who developed skin reaction had dry skin, 26% had mixed skin and 53% had oily skin. Another study showed that wearing surgical facemasks was associated with higher incidence of developing any skin reaction in comparison to masks made of cloth. This same study showed the duration of wearing masks was directly correlating with the development of skin reactions. Additionally, the study reported that skin reactions related to facemasks in healthcare workers (HCWs) was higher than that in non-HCW participants and that not changing the masks frequently can increase the risk of developing skin reactions 1.5 more (Techasatian et al., 2020). Conversely, another study reported that profession was not associated with the development of any kind of skin reaction in addition to race and gender (Foo et al., 2006). However, gender was

reported to be a significant factor in another study where male participants reported higher rates of skin reactions (58.7%) when compared to their female counterparts (41.3%) (Alkubaisi, 2020). This came in contrast to the results reported by Chaiyabutr et al. (2020) where 65.1% of their female participants reported developing skin reaction while 54.5% of the male participants reported these reactions in a sample of 767 participants. Out of these participants, 32.2% reported that their skin reactions were Maskne. They further categorized Maskne into 3 levels of severity (mild-moderate-severe). The majority of cases (n=495, 86.5%) were mild, 56 (12.5%) were moderate and 6 (1%) cases were severe (Chaiyabutr et al., 2020).

Considering the controversy in the above findings and the lack of such studies in the Lebanese community, a study is needed to identify the causes of Maskne development in a society challenged by many causes for anxiety and stress. The Lebanese adult population have high levels of stress and psychological instabilities due to constant political and economic crisis, and recently the Covid-19 pandemic. Thus the aim of the current study is to evaluate the effect of frequently wearing facemasks on the development on Maskne and identifying the effect of psychological turbulence such as stress on its development.

## 2. METHODOLOGY

This cross-sectional descriptive study involving self-administered questionnaire aims to evaluate the effect of regularly wearing a mask on the development of acne and to provide recommendations for practice to avoid the development of this skin disorder. The eligibility for inclusion in this study was being adult from the community aged 18 years and above, located in Lebanon. Data were collected virtually through google forms. First, Institutional Review Board approval was secured from Beirut Arab University and administration approval from the Faculty of Health Sciences. The questionnaire in English language was generated on Google forms. The link of the questionnaire was disseminated through social media; Facebook, Instagram and to the WhatsApp groups of the research group who are nursing BS students at the Faculty of Health Sciences. Data were collected through a self-administered questionnaire (Appendix A) developed for this study. The questionnaire included the below sections:

A. Sociodemographic characteristics: This section included age, gender, occupation, living region, level of education, marital status, income, and working hours in addition to the weight, and height of the study participants. Social history consisted of smoking status, alcohol use, pregnancy, and number of children.
B. Medical history included health conditions that triggered the release of excess cortisol including Cushing disease, adrenal abnormalities, and Conn's syndrome, or abnormal gonadal hormone levels as in polycystic ovarian syndrome. Also, medication use including oral contraceptives and steroids. It also included gastric problems that cause "leaky gut" and alterations gut microbiome such as inflammatory bowel disease, irritable bowel syndrome, bacterial gastroenteritis, low gastric acid levels.
C. Lifestyle section included eating habits, exercise duration, level (moderate vs severe), sweating, hours spent wearing a mask, and stress.
D. Acne development and risk factors section included hours spent wearing a mask, face mask changing or washing habits, skin type, facial products use, family history of acne, and acne grading.
E. Subjective acne severity rating was collected through a 10-point Likert scale where participants rated the number of pimples they got. A rating of 0 represented "none" and 9 represented "the most you have ever had". Additionally, the severity of acne-related symptoms was evaluated such as redness and inflammation, acne pustules and puss filled pimples, scarring, and oiliness where a rating of 0 indicated "not at all" and a rating of 9 indicated "very markedly".
F. Investigator's Global Assessment Scale (IGA) was used as a tool for evaluating acne severity. 'Clear' indicated residual hyperpigmentation and erythema may be present, 'Almost clear' meant few scattered comedones and a few small papules, 'Mild' meant easily recognizable with less than half the face involved with some comedones and some papules and pustules. 'Moderate' meant more than half the face involved with many comedones, papules and pustules and one nodule may be present, 'Severe' meant entire face involved and covered with comedones and numerous papules and pustules and few nodules and cysts. The IGA is a single item 5-point

scale that is used to evaluate the perceived severity of the acne. It was found to have good convergent validity when compared to other scales reporting similar finding (Simpson et al., 2020).

G. Perceived Stress Scale (PSS) was used to evaluate stress. PSS is a 10-item tool that assesses perceived stress. It has shown good reliability with a Cronbach alpha over 0.7 when reported in 12 different studies (Lee, 2012). Good fit indices were reported when confirmatory factor analysis was done to show the scale predicting anxiety and depression (Liu et al., 2020).

## 3. DATA ANALYSIS

In univariate analysis, standard deviation and means were used to present the data for continuous variables, while for categorical variables percentages and frequencies were applied. Bivariate analysis for categorical variables was done using chi square. For normally distributed continuous variables t test was used, and analysis for non-parametric testing which is Mann Whitney was used for non-normally distributed variables. Difference between variables was considered significant when p value was less than 0.05. Data analysis was done using version 24 of SPSS.

## 4. ETHICAL CONSIDERATION

Institutional Review Board from the Beirut Arab University and administration approval from the Faculty of Health Sciences were guaranteed. The aim of the study, the perceived low risk, the benefit of the information retrieved from the findings, and the confidentiality of the information and the privacy of the study participants were mentioned at the beginning of the questionnaire in a brief summary. The participant's consent to share in the study was assumed when the participant completed the questionnaire. All collected data were anonymized. Confidentiality and privacy were maintained. Data will be stored securely under double lock and key for a minimum of five years following the completion of the study.

## 5. RESULTS
### 5.1 Descriptive Data

The final sample was 305 participants. The mean age of the sample was 22.62 years (SD=6.29) with the majority being female (n=218, 71.5%). The participants were mostly students (n=203, 66.6%) and those who worked full time accounted for n=59 (19.3%). All the participants were living in Lebanon with more than half living in Beirut region (n=172, 56.4%). The majority had bachelor's degrees (n=200, 65.6%) and n=269 (88.2%) were single. Of those who were employed, more than half were on the low side of income status where n=62 (20.3%) had salaries between 500,000LL and 1,000,000LL, and the majority (n=175, 57.4%) were unemployed. When studying their medical profile, few participants had Cushing syndrome (n=3, 1%), adrenal abnormalities (n=4, 1.3%), Conn's disease (n=2, 0.7%), polycystic ovarian syndrome (n=20, 6.6%) and inflammatory bowel disease (n=4, 1.3%). Females who used oral contraceptives were only n=15 (4.9%), and participants using corticosteroids were n=9 (3%). Lifestyle data analysis showed that n=103 (33.8) were smokers and only n=20 (6.6%) consumed alcohol. Almost half of the participants had a healthy diet (n=163, 53.4%). Most of the study participants experienced additional stress two weeks prior data collection n= (243, 79.7%) and half of those who experienced stress developed Maskne (n=122, 40%). Those who were engaged in physical activity 1-2 times/week were the majority accounting for n=109 (35.7%) and n=98 (32.1%) performed mild levels of exercise. Those who reported sweating a lot were less than those who did not (n=112, 36.7% vs. n=193, 63.3% respectively). Of those with current acne (n=124, 40.7%), n=87 (28.5%) developed acne after wearing a mask. The demographic and clinical characteristics are presented in Table 1.

Table 1: Presentation of the sociodemographic characteristics of the study participants (N=305)

| Variables | Total (N=305, 100%) | Having Maskne (n=140, 45.9%) | Not having Maskne (n=165, 54.1%) | p value |
|---|---|---|---|---|
| **Sociodemographic data** | | | | |
| Age* | 22.62 (6.29) | 22.16 (3.92) | 23.02 (7.765) | 0.215 |
| Gender | | | | 0.004** |
| • Male | 87 (28.5) | 29 (9.5) | 58 (19) | |
| • Female | 218 (71.5) | 111 (36.4) | 107 (35.1) | |
| Occupation | | | | 0.64 |
| • Full time | 59 (19.3) | 31 (10.2) | 28 (9.2) | |
| • Part timer employment | 7 (2.3) | 4 (1.3) | 3 (1) | |
| • Retired/unemployed. | 21 (6.9) | 11 (3.6) | 10 (3.3) | |
| • Self-employed | 15 (4.9) | 7 (2.3) | 8 (2.6) | |
| • Student | 203 (66.6) | 87 (28.5) | 116 (38) | |
| Living region | | | | 0.339 |
| • Beirut | 172 (56.4) | 85 (27.9) | 87 (28.5) | |
| • Beqaa region | 3 (1) | 1 (0.3) | 2 (0.7) | |
| • Mount Lebanon | 54 (17.7) | 21 (6.9) | 33 (10.8) | |
| • South | 67 (22) | 27 (8.9) | 40 (13.1) | |
| • North | 9 (3) | 6 (2) | 3 (1) | |
| Level of education | | | | 0.162 |
| • Bachelor | 200 (65.6) | 95 (31.1) | 105 (34.4) | |
| • High school | 40 (13.1) | 13 (4.3) | 27 (8.9) | |
| • Higher degrees | 51 (16.7) | 26 (8.5) | 25 (8.2) | |
| • Illiterate | 4 (1.3) | 0 (0) | 4 (1.3) | |
| • Primary school | 3 (1) | 2 (0.7) | 1 (0.3) | |
| • vocational | 7 (2.3) | 4 (1.3) | 3 (1) | |
| Marital status | | | | 0.170 |
| • Single | 269 (88.2) | 128 (42) | 141 (46.2) | |
| • Married | 34 (11.1) | 12 (3.9) | 22 (7.2) | |
| • Divorced/widowed/separated | 2 (0.7) | 0 (0) | 2 (0.7) | |
| Income | | | | 0.079 |
| • 500,000LL to 1,000,000LL | 62 (20.3) | 34 (11.1) | 28 (9.2) | |
| • 1,000,000LL 3,000,000LL | 59 (19.3) | 32 (10.5) | 27 (8.9) | |
| • More than 3,000,000LL | 23 (7.5) | 7 (2.3) | 16 (5.2) | |
| • Not applicable | 125 (41) | 49 (16.1) | 76 (24.9) | |
| Working hours per week | | | | 0.134 |
| • Less than 40 hours | 64 (21) | 36 (11.8) | 28 (9.2) | |
| • 40 hours or more | 66 (21.6) | 31 (10.2) | 35 (11.5) | |
| • Not applicable | 175 (57.4) | 73 (23.9) | 102 (33.4) | |
| Weight* | 66.65 (18.024) | 64.85 (18.85) | 68.21 (17.17) | 0.106 |
| Height* | 165.79 (14.826) | 164.78 (8.79) | 166.65 (18.48) | 0.273 |
| **Medical profile** | | | | |
| Cushing syndrome | 3 (1) | 2 (0.7) | 1 (0.3) | 0.486 |
| Adrenal abnormalities | 4 (1.3) | 1 (0.3) | 3 (1) | 0.398 |
| Conn's syndrome | 2 (0.7) | 1 (0.3) | 1 (0.3) | 0.907 |
| Polycystic ovarian syndrome | 20 (6.6) | 11 (3.6) | 9 (3) | 0.169 |
| Inflammatory bowel disease | 4 (1.3) | 0 (0) | 4 (1.3) | 0.064 |
| Irritable bowel syndrome | 11 (3.6) | 5 (1.6) | 6 (2) | 0.976 |
| Bacterial gastroenteritis | 9 (3) | 5 (1.6) | 4 (1.3) | 0.555 |
| Gastric ulcer | 15 (4.9) | 8 (2.6) | 7 (2.3) | 0.554 |
| Low stomach acid | 23 (7.5) | 16 (5.2) | 7 (2.3) | 0.018** |
| Diarrhea | 16 (5.2) | 9 (3) | 7 (2.3) | 0.393 |

| Variables | Total (N=305, 100%) | Having Maskne (n=140, 45.9%) | Not having Maskne (n=165, 54.1%) | p value |
|---|---|---|---|---|
| Constipation | 55 (18) | 39 (12.8) | 16 (5.2) | 0.000** |
| Bloating | 60 (19.7) | 39 (12.8) | 21 (6.9) | 0.001** |
| **Medication use** | | | | |
| Oral contraceptives | 15 (4.9) | 11 (3.60) | 4 (1.3) | 0.005** |
| Corticosteroids | 9 (3) | 5 (1.6) | 4 (1.3) | 0.555 |
| **Lifestyle** | | | | |
| Smoking | 103 (33.8) | 46 (15.1) | 57 (18.7) | 0.756 |
| Alcohol | | | | 0.466 |
| • Daily | 2 (0.7) | 1 (0.3) | 1 (0.3) | |
| • Weekly | 4 (1.3) | 1 (0.3) | 3 (1) | |
| • Monthly | 14 (4.6) | 4 (1.3) | 10 (3.3) | |
| • None | 285 (93.4) | 134 (43.9) | 151 (49.5) | |
| How many children do you have* | 0.21 (0.871) | 0.11 (0.44) | 0.30 (1.10) | 0.44 |
| Eating habits | | | | 0.267 |
| • Healthy | 163 (53.4) | 70 (23) | 93 (30.5) | |
| • Unhealthy | 142 (46.6) | 70 (23) | 72 (23.6) | |
| Additional stress in the past 2 weeks | 243 (79.7) | 122 (40) | 121 (39.7) | 0.003** |
| Physical activity | | | | 0.547 |
| • 1-2 times/week | 109 (35.7) | 54 (17.7) | 55 (18) | |
| • 2-3 times/week | 50 (16.4) | 19 (6.2) | 31 (10.2) | |
| • 4-5 times/week | 49 (16.1) | 24 (7.9) | 25 (8.2) | |
| • None | 97 (31.8) | 43 (14.1) | 54 (17.7) | |
| Level of exercise | | | | 0.415 |
| • Heavy | 26 (8.5) | 13 (4.3) | 13 (4.3) | |
| • Moderate | 95 (31.1) | 39 (12.8) | 56 (18.4) | |
| • Mild | 98 (32.1) | 51 (16.7) | 47 (15.4) | |
| • None | 86 (28.2) | 37 (12.1) | 49 (16.1) | |
| Excessive sweating | 112 (36.7) | 55 (18) | 57 (18.7) | 0.392 |
| Current acne development | | | | 0.000** |
| • Yes | 124 (40.7) | 87 (28.5) | 37 (12.1) | |
| • No | 181 (59.3) | 53 (17.4) | 128 (42) | |

Legend: *data presented in means and standard deviation; **significant at p <0.05

## 5.2 Risk Factors for Acne Development

When studying the risk factors, it was found that the mean hours spent wearing a mask per day was 4.31 hours (SD=3.82). The type of mask used was mostly disposable (n=225, 73.8%), or reusable fabric mask (n=54, 17.7%). Most of the participants who used the surgical mask (n=165,54.1%) or N-95 mask (n=36, 11.8%) changed it daily and most of those who used a fabric mask washed it daily (n=52, 17%). Almost half of those who used masks (n=140, 45.9%) noticed acne development after wearing a mask for a long period of time. The majority had a combination skin type (n=110, 36.1%), while those with oily skin accounted for n=96 (31.5%) and more than half of them (n=55, 18%) experienced Maskne. One third of those who had sensitive skin and family history of acne experienced Maskne development (n=101, 33.1%) and (n=59, 19.3%) respectively. Of those who perceived themselves as moody (n=217, 71.1%), n=107 (35.1%) experienced Maskne. Some of the participants usually experienced acne due to hot weather (n=113,37%) and most of them (n=70,23%) had Maskne. Detailed information on risk factors for acne development is presented in Table 2.

Table 2: Risk factors for acne development (N=305)

| Variables | Total (N=305, 100%) | Having Maskne (n=140, 45.9%) | Not having Maskne (n=165, 54.1%) | P value |
|---|---|---|---|---|
| Mean hours wearing a mask* | 4.31 (3.82) | 5.11 (4.16) | 3.64 (3.37) | 0.001** |
| Type of mask | | | | 0.112 |
| • Disposable (surgical) | 225 (73.8) | 101 (33.1) | 124 (40.7) | |
| • N-95 | 14 (4.6) | 10 (3.3) | 4 (1.3) | |
| • Washable/reusable (fabric) | 54 (17.7) | 26 (8.5) | 28 (9.2) | |
| • I do not use a mask | 12 (3.9) | 3 (1) | 9 (3) | |
| Changing disposable mask | | | | 0.129 |
| • Every couple hour | 43 (14.1) | 25 (8.2) | 18 (5.9) | |
| • Daily | 165 (54.1) | 74 (24.3) | 91 (29.8) | |
| • Weekly | 41 (13.4) | 18 (5.9) | 23 (7.5) | |
| • I do not change it. | 9 (3) | 1 (0.3) | 8 (2.6) | |
| • Not applicable | 47 (15.4) | 22 (7.2) | 25 (8.2) | |
| Washing reusable mask | | | | 0.664 |
| • Every day | 52 (17) | 25 (8.2) | 27 (8.9) | |
| • Every week | 29 (9.5) | 16 (5.2) | 13 (4.3) | |
| • Every month | 11 (3.6) | 5 (1.6) | 6 (2) | |
| • I do not wash it. | 14 (4.6) | 8 (2.6) | 6 (2) | |
| • Not applicable | 199 (65.2) | 86 (28.2) | 113 (37) | |
| Changing N-95 mask | | | | 0.313 |
| • Every couple hour | 9 (3) | 5 (1.6) | 4 (1.3) | |
| • Daily | 36 (11.8) | 21 (6.9) | 15 (4.9) | |
| • Weekly | 12 (3.9) | 7 (2.3) | 5 (1.6) | |
| • I do not change it. | 3 (1) | 2 (0.7) | 1 (0.3) | |
| • Not applicable | 245 (80.3) | 105 (34.4) | 140 (45.9) | |
| Skin type | | | | 0.01** |
| • Dry | 26 (8.5) | 8 (2.6) | 18 (5.9) | |
| • Oily | 96 (31.5) | 55 (18) | 41 (13.4) | |
| • Combination | 110 (36.1) | 52 (17) | 58 (19) | |
| • Normal | 51 (16.7) | 20 (6.6) | 31 (10.2) | |
| • I do not know | 22 (7.2) | 5 (1.6) | 17 (5.6) | |
| Sensitive skin | 181 (59.3) | 101 (33.1) | 80 (26.2) | 0.000** |
| Acne family history | 105 (34.4) | 59 (19.3) | 46 (15.1) | 0.009** |
| Moody | 217 (71.1) | 107 (35.1) | 110 (36.1) | 0.061 |
| Acne due to hot weather | 113 (37) | 70 (23) | 43 (14.1) | 0.000** |

Legend: *data presented in means and standard deviation; **significant at p <0.05

## 5.3 Outcome Data

More than half of the study participants had a history of acne (n=172, 56.4%). New facial products were used by more than half of the participants (n=164, 53.8%) and most of the products (n=106, 34.8%) had a hydrating effect on the skin. Most of those who had acne experienced no other symptoms (n=148, 48.5%), and the majority graded their acne as mild (n=145, 47.5%). The mean patient rating (on the 10-point scale of the severity of acne affecting the face) was 2.96 (SD=2.546) for number of acne pimples, 2.68 (2.675) for redness and inflammation, 2.21 (2.460) for acne pustules and puss-filled acne, 2.66 (2.841) for scarring from acne or pitting, and 2.80 (2.747) for excessive oiliness of skin. The investigator's global assessment showed that of those with acne (n=83, 27.2%) had mild acne and n=86 (28.2%) had almost clear acne. Table 3 presents further data on acne development, rating, and treatment.

Table 3: Acne development and related symptoms (N=305)

| Variables | Total (N=305, 100%) | Having Maskne (n=140, 45.9%) | Not having Maskne (n=165, 54.1%) | P value |
|---|---|---|---|---|
| Previous acne | 172 (56.4) | 96 (31.5) | 76 (24.9) | 0.000** |
| New facial products use | 164 (53.8) | 90 (29.5) | 74 (24.3) | 0.001** |
| Effect of product on skin | | | | 0.011** |
| • Drying | 42 (13.8) | 23 (7.5) | 19 (6.2) | |
| • Hydrating | 106 (34.8) | 56 (18.4) | 50 (16.4) | |
| • No changes | 39 (12.8) | 21 (6.9) | 18 (5.9) | |
| • Not applicable | 118 (38.7) | 40 (13.1) | 78 (25.6) | |
| Acne symptoms | | | | 0.001** |
| • Itch | 59 (19.3) | 29 (9.5) | 30 (9.8) | |
| • Painful skin | 37 (12.1) | 21 (6.9) | 16 (5.2) | |
| • No symptoms | 148 (48.5) | 76 (24.9) | 72 (23.6) | |
| • Not applicable | 61 (20) | 14 (4.6) | 47 (15.4) | |
| Grade of acne | | | | 0.000** |
| • Mild | 145 (47.5) | 75 (24.6) | 70 (23) | |
| • Moderate | 76 (24.9) | 45 (14.8) | 31 (10.2) | |
| • Severe | 8 (2.6) | 3 (1) | 5 (1.6) | |
| • Not applicable | 76 (24.9) | 17 (5.6) | 59 (19.3) | |
| Number of acne pimples* | 2.96 (2.546) | 3.80 (2.57) | 2.25 (2.30) | 0.0** |
| Redness and inflammation* | 2.68 (2.675) | 3.50 (2.64) | 1.98 (2.49) | 0.000** |
| Acne pustules and puss-filled acne* | 2.21 (2.460) | 2.96 (2.62) | 1.58 (2.12) | 0.000** |
| Scarring from acne or pitting* | 2.66 (2.841) | 3.51 (2.95) | 1.95 (2.54) | 0.000** |
| Excessive oiliness of skin* | 2.80 (2.747) | 3.55 (2.95) | 2.16 (2.39) | 0.013** |
| IGA | | | | 0.000** |
| • 0 – clear | 104 (34.1) | 21 (6.9) | 83 (27.2) | |
| • 1 – almost clear | 86 (28.2) | 52 (17) | 34 (11.1) | |
| • 2 – mild | 83 (27.2) | 47 (15.4) | 36 (11.8) | |
| • 3 – moderate | 26 (8.5) | 18 (5.9) | 8 (2.6) | |
| • 4 – severe | 6 (2) | 2 (0.7) | 4 (1.3) | |

Legend: *data presented in means and standard deviation; **significant at p <0.05; IGA: Investigator's global assessment.

## 5.4 Perceived stress among the study participants

More than one third of the participants (n=115, 37.7%) were upset because of something that happened unexpectedly in the last month fairly often. Less than one third (n=84, 27.5%) sometimes felt that they were unable to control the important things in their lives, A similar number (n=86, 28.2%) felt nervous and stressed, and slightly more (n=108, 35.4%) felt confident about their ability to handle personal problems. Also, n=115 (37.7%) of the participants felt that things were going their way sometimes, a similar number (n=105, 34.4%) found that they could not cope with all the things that they had to do sometimes. Slightly more participants (n=125, 41%) were able to control irritations in their lives sometimes, n=101 (33.1%) felt that they were on top of things sometimes, n=83 (27.2%) sometimes were angered because of things that happened, and n=101 (33.1%) sometimes felt difficulties were piling up so high that they could not overcome them. Detailed data on the perceived stress scale data are presented in Table 4.

Table 4: Perceived stress scale on the study participants (N=305)

| Variables | Total (N=305, 100%) | Having Maskne (n=140, 45.9%) | Not having Maskne (n=165, 54.1%) | P value |
|---|---|---|---|---|
| l. In the last month, how often have you been upset because of something that happened unexpectedly? | | | | 0.86 |
| • Never | 45 (14.8) | 14 (4.6) | 31 (10.2) | |
| • Almost never | 23 (7.5) | 12 (3.9) | 11 (3.6) | |
| • Sometimes | 115 (37.7) | 49 (16.1) | 66 (21.6) | |
| • Fairly often | 51 (16.7) | 25 (8.2) | 26 (8.5) | |
| • Very often | 71 (23.3) | 40 (13.1) | 31 (10.2) | |
| 2. In the last month, how often have you felt that you were unable to control the important things in your life? | | | | 0.045** |
| • Never | 46 (15.1) | 14 (4.6) | 32 (10.5) | |
| • Almost never | 62 (20.3) | 26 (8.5) | 36 (11.8) | |
| • Sometimes | 84 (27.5) | 37 (12.1) | 47 (15.4) | |
| • Fairly often | 49 (16.1) | 29 (9.5) | 20 (6.6) | |
| • Very often | 64 (21) | 34 (11.1) | 30 (9.8) | |
| 3. In the last month, how often have you felt nervous and stressed? | | | | 0.033** |
| • Never | 35 (11.5) | 10 (3.3) | 25 (8.2) | |
| • Almost never | 35 (11.5) | 15 (4.9) | 20 (6.6) | |
| • Sometimes | 86 (28.2) | 36 (11.8) | 50 (16.4) | |
| • Fairly often | 56 (18.4) | 25 (8.2) | 31 (10.2) | |
| • Very often | 93 (30.5) | 54 (17.7) | 39 (12.8) | |
| 4. In the last month, how often have you felt confident about your ability to handle your personal problems? | | | | 0.113 |
| • Never | 31 (10.2) | 9 (3) | 22 (7.2) | |
| • Almost never | 51 (16.7) | 21 (6.9) | 30 (9.8) | |
| • Sometimes | 108 (35.4) | 57 (18.7) | 51 (16.7) | |
| • Fairly often | 67 (22) | 34 (11.1) | 33 (10.8) | |
| • Very often | 28 (15.7) | 19 (6.2) | 29 (9.5) | |
| 5. In the last month, how often have you felt that things were going your way? | | | | 0.014** |
| • Never | 42 (13.8) | 14 (4.6) | 28 (9.20) | |
| • Almost never | 84 (37.5) | 46 (15.1) | 38 (12.5) | |
| • Sometimes | 115 (37.7) | 57 (18.7) | 58 (19) | |
| • Fairly often | 36 (11.8) | 9 (3) | 27 (8.9) | |
| • Very often | 28 (9.2) | 14 (4.6) | 14 (4.6) | |
| 6. In the last month, how often have you found that you could not cope with all the things that you had to do? | | | | 0.014** |
| • Never | 49 (16.1) | 14 (4.6) | 35 (11.5) | |
| • Almost never | 67 (22) | 33 (10.8) | 34 (11.1) | |
| • Sometimes | 105 (34.4) | 44 (14.4) | 61 (20) | |
| • Fairly often | 58 (19) | 35 (11.5) | 23 (7.5) | |
| • Very often | 26 (8.5) | 14 (4.6) | 12 (3.9) | |
| 7. In the last month, how often have you been able to control irritations in your life? | | | | 0.125 |
| • Never | 44 (14.4) | 13 (4.3) | 31 (10.2) | |
| • Almost never | 61 (20) | 29 (9.5) | 32 (10.5) | |
| • Sometimes | 125 (41) | 65 (21.3) | 60 (19.7) | |
| • Fairly often | 40 (13.1) | 19 (6.2) | 21 (6.9) | |
| • Very often | 35 (11.5) | 14 (4.6) | 21 (6.9) | |
| 8. In the last month, how often have you felt that you were on top of things? | | | | 0.005** |
| • Never | 58 (19) | 19 (6.2) | 39 (12.8) | |
| • Almost never | 82 (26.9) | 50 (16.4) | 32 (10.5) | |
| • Sometimes | 101 (33.1) | 44 (14.4) | 57 (18.7) | |
| • Fairly often | 45 (14.8) | 22 (7.2) | 23 (7.5) | |
| • Very often | 19 (6.2) | 5 (1.6) | 14 (4.6) | |

| Variables | Total (N=305, 100%) | Having Maskne (n=140, 45.9%) | Not having Maskne (n=165, 54.1%) | P value |
|---|---|---|---|---|
| 9. In the last month, how often have you been angered because of things that happened that were outside of your control? | | | | 0.333 |
| •     Never | 38 (12.5) | 12 (3.9) | 26 (8.5) | |
| •     Almost never | 60 (19.7) | 26 (8.5) | 34 (11.1) | |
| •     Sometimes | 83 (27.2) | 39 (12.8) | 44 (14.4) | |
| •     Fairly often | 68 (22.3) | 34 (11.1) | 34 (11.1) | |
| •     Very often | 56 (18.4) | 29 (9.5) | 27 (8.9) | |
| 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? | | | | 0.016** |
| •     Never | 60 (19.7) | 17 (5.6) | 43 (14.1) | |
| •     Almost never | 60 (19.7) | 25 (8.2) | 35 (11.5) | |
| •     Sometimes | 101 (33.1) | 56 (18.4) | 45 (14.8) | |
| •     Fairly often | 43 (14.1) | 21 (6.9) | 22 (7.2) | |
| •     Very often | 41 (13.4) | 21 (6.9) | 20 (6.6) | |

Legend: *data presented in means and standard deviation; **significant at p <0.05

## 5.5 Main results

When comparing the groups, it was found that there was a significant difference between the male and female participants in terms of Maskne development (n=29, 9.5% vs. n=111, 36.4%; p=0.004). Another significant difference was seen in gastric acid where those who had Maskne reported having low gastric acid than those who did not (n=16, 5.2% vs. n=7, 2.3%; p=0.017). Similarly, constipation was reported in higher rates among those who developed Maskne when compared to those that did not (n=39, 12.8% vs. n=16, 5.2%; p=0.000), Similar findings were reported in terms of bloating (n=39, 12.8% vs. 21, 6.9%; p=0.001). Significant difference was found in females who took oral contraceptives too where the majority got Maskne (n=11, 3.60% vs. n=4, 1.3%; p=0.005) in comparison to those who did not take those medications.

In terms of risk factors, significant difference was noted in the number of hours wearing a mask per day was a mean of 5.11 (SD=4.16) for those who got Maskne compared to those who wore the mask less

Skin type showed significant difference where people with oily skin that got Maskne (n=55, 18%) were more than those of them who did not get Maskne (n=41, 13.4%) with a p value of 0.007. Likewise, those with sensitive skin were more prone to get Maskne than those with non-sensitive skin (n=101, 33.1% vs. n=80, 26.2%; p=0.000). Similarly, those with positive family history of acne development were significantly more likely to have acne (n=59, 19.3% vs. n=46, 15.1); p=0.09). Finally, hot weather was perceived as a significant cause of acne development as presented in Table 2.

History of acne was significantly associated with Maskne development, where those who previously developed acne were more likely to develop Maskne when compared to those with no acne history (n=96, 31.5% vs. n=76, 24.9%; p=0.000). Another significant difference was seen in using new facial products, where it was more likely for participants who used new products to report Maskne than those who were not using them (n=90, vs. n=74, 24.3%; p=0.001). The effect of products on the skin contributed to acne development. Participants who used products that had a hydrating effect and got Maskne were more than those who did not get Maskne (n=56, 18.4% vs. n=49, 16.1%; p=0.011).

In terms of perceived stress, it was noted that Maskne development was significantly lower among those who were often able to control the important things in their lives while those who felt nervous and stressed very often were more likely to develop Maskne than their counterparts. Similarly, those who reported to have things going their way often developed less acne (n=23, 7.6% vs. =41, 13.5%; p=0.014). Similar findings were seen with participants who could cope and were on top of things as reported in Table 4.

## 6. DISCUSSION

The aim of the study was to evaluate the effect of regularly wearing a mask on the development of acne and to provide recommendations for practice to avoid the development of this skin disorder. This was addressed by doing a cross sectional descriptive study involving a self-administered questionnaire. The main results showed significant difference between those who got Maskne and those who did not after wearing a mask for long hours, noting the factors that can increase the risk of acne development. Similar findings were found in a study that showed the longer duration of wearing masks was positively correlating with the development of skin reactions (Techasatian et al., 2020). Similarly, another study showed that skin break down was significantly associated with the number of hours these masks were wore where skin breakdown developed after five hours of facemask wearing (Alkubaisi, 2020). When looking at other factors associated with Maskne development it was found that the majority were females which is the gender that is generally more prone to acne development due to constant hormonal changes. This comes in line with the results reported by Chaiyabutr et al. (2020) where 65% of their female participants reported developing skin reactions in a sample of 767 participants. However, this finding contradicts that reported by another study, which showed that male participants reported higher rates of skin reactions (58.7%) when compared to their female counterparts (41.3%) (Alkubaisi, 2020).

When evaluating the Maskne symptoms, 19.3% experienced itch, which shows that masks may cause adverse effects to the skin barrier causing irritation. Itching was similarly reported in another study conducted in a sample of 1393 Polish students aged between 18 and 27 years where 19.6% reported itching after wearing facemasks regularly in the past week (Szepietowski, Matusiak, Szepietowska, Krajewski, & Białynicki-Birula, 2020).

The findings of the current study showed that participants who used products that had a drying effect were more prone to acne development than those who did not use these products. This contrasts another study that showed that 39% of the study participants reported rashes or redness on the face and 67.60% experienced excessive sweating around the mouth (Purushothaman et al., 2020). Heat and humidity can trigger anhidrosis, which will cause moisture to get trapped under the skin leading to dryness. In addition to the friction that impairs the skin barrier, moisture can evaporate effortlessly, which could cause a dry and dehydrated skin. Similarly, Chaiyabutr et al. (2020) reported that Maskne was linked to the type of skin where 21% of those who developed this type of skin reaction had dry skin, 26% had mixed skin and 53% had oily skin. The Investigator's global assessment IGA showed significant differences, those whose acne was due to wearing masks for long periods had mild or moderate acne, where they accounted for 15.4%, and 5.9% respectively. In a similar study, they categorized Maskne into three levels of severity (mild-moderate-severe). However, the rates differed to show that the 86.5% were mild and 12.5% were moderate (Chaiyabutr et al., 2020). This study was conducted in Thailand in May 2020 where the temperature in that that area shows extreme heat and humidity, while our data were collected in March during colder weather. This may be the contributing factor that lead to the huge difference in percentages. Significant differences were seen among those with gastrointestinal problems. Problems with gastric acid showed that those who had Maskne reported having low gastric acid compared to those who reported normal gastric acidity. This is similar to a study that showed marked hypochlorhydria displayed in 75% of the study participants who reported one type of skin abnormality: rosacea. Similarly, constipation and bloating were reported in higher rates among those who developed Maskne. The relationship between constipation and bloating with acne was evaluated in a cross-sectional case control study. Cases and controls with acne vulgaris were compared for gastrointestinal dysfunction symptoms. Abdominal bloating and constipation were significantly more frequent in the group with moderate to severe acne compared to the control group (Esmaeili, Halimi, & Hagigi, 2014). Additionally, significant differences were found in the perceived stress scale scores. Those who got Maskne among those who were always able to control the important things in their lives were significantly less than those who were not. Similarly, among those who were never stressed, were able to cope with things, felt that they were on top of things and those who never felt that difficulties were piling up so high reported less incidence of acne development. This comes in line with the study conducted on healthcare professionals which showed higher incidence of acne during higher levels of stress (Garg et al., 2001).

## 7. LIMITATION

A number of limitations were evident in this study. The first limitation concerns the design where a cross-sectional design does not verify if the exposure or the outcome came first since both are examined at the same time. The other limitation is the high possibility of recall and social desirability bias associated with the design. Another limitation was in the higher percentage of participants in the younger age group thus limiting the generalizability of the findings. This could also be due to the recruitment process through social media where the majority of users of these platforms are young adults. Additionally, most of the participants were students with a bachelor's degree level of education and were mostly single. More than half of the participants were females (hormonal changes can affect the result of facemask related adverse effects on the skin) and most of them were living in Beirut region whereas the rest were distributed in other regions in Lebanon. Finally, considering that the questionnaire was self-administered with no assessment of the participants faces upon the study timing, the researchers could not rule out the possibility of other causes to acne development besides the frequent wearing of masks. This should be addressed in future studies.

## 8. STRENGTH

Strength of the study was seen in the sample size (305 participants), it was fairly quick, cheap, and easy to conduct (no long periods of follow-up) and records on all variables were only gathered once. The study showed the prevalence of Maskne with other health-related acne attributes which is important for the public health to assess the burden of this condition in the Lebanese population and in planning and allocating health resources.

## 9. CONCLUSION

In this study, the association between wearing facemasks and acne development during the covid-19 pandemic was identified. There was a significant difference after wearing a mask for prolonged periods of time in acne development, redness, and oiliness. Although wearing a mask during this pandemic is definitely necessary, expected skin changes can be avoided and skin health can be preserved with the appropriate measures. These include a healthy diet, stress management, staying hydrated, never scratching the skin, and using new products underneath the mask. Also, It's important to take a safe break from the mask and cleanse and moisturize the skin properly. Additional studies are needed to better understand how to manage mask-related acne development and inform clinical decision-making.

## 10. RECOMMENDATIONS

The conduct of this study yielded results that can be used for future recommendations in terms of education, practice, and research. The following section provides these recommendations.

**10.1 Recommendations in terms of education**: this section involves educating the public.

- To maintain a healthy diet high in fiber to reduce the gastrointestinal problems including constipation, which in term can worsen the acne.
- On stress management which is challenging in a country with consecutive crises. Things that can help with stress include exercise, music, and meditation.
- On the importance of staying hydrated to avoid dry skin which can trigger excess oil production that can increase the risk of Maskne.
- In case of itchy skin, never scratch it because it can cause further skin injury, infection, and scarring.
- To avoid trying new skin care products that can further irritate your skin because wearing a mask can make your skin more sensitive.
- To check in with the dermatologist if symptoms are severe.

**10.2 Recommendations in terms of practice:**

- Taking frequent breaks of mask wearing only when physically distant from people to shorten the duration of mask-to-skin contact and to allow the skin to breathe is recommended.

- Cleanse the skin properly especially after wearing the mask to remove excess oil that can clog the pores.
- Use noncomedogenic moisturizers that contain ceramides (forms a protective layer and locks in moisture) and take a break from makeup.
- If taking oral contraceptives, maintain good skin care routine that is suitable for skin type.

### 10.3 Recommendations in terms of research:

- More studies should be conducted on the causes and predictors of Maskne development in a time of frequent mask wearing during the COVID-19 pandemic.
- Research culture should be enhanced by educating the public on its importance to promote the flow of its conduct.

## 11. ACKNOWLEGEMENT

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