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Dermatological Changes from Hand Hygiene Practices Among Adults in Lagos, Nigeria During the COVID-19 Pandemic

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Abstract: *Background*: With the COVID–19 global pandemic and rising figures of infection in all regions of the world; the awareness of, and for hand hygiene is unprecedented. Frequent hand hygiene exposes the skin to changes in skin physiology which cause dryness and irritation. This study, therefore, aims to assess and document the dermatological effects that may emanate from this preventive measure. *Methodology*: The study was a descriptive cross-sectional study among 502 adults (18 years and over) resident in Lagos State. Data was collected through a survey using a pretested, google forms platform questionnaire, and analysis was carried out using Microsoft Excel 2010 and SPSS statistical software. The level of significance was predetermined at $p<0.05$. *Results*: On the whole, over half (55.6%) of the respondents had good hand hygiene practices for the prevention of COVID-19 infection. A prior skin disorder diagnosed by a doctor, pre-COVID-19 was found in 3.4% of respondents and 33.3% of them had their conditions worsened with COVID-19. Also, 18.3% of the respondents noticed adverse effects on the skin since the start of practicing hand hygiene more frequently since COVID-19. However, the respondents' level of hand hygiene did not show a statistically significant association with the presence of worsening dermatological conditions ($p=0.638$). *Conclusion*: The study showed that about half of the respondents practiced good hand hygiene and a few of them reported dermatological changes since the start of practicing hand hygiene for the prevention of COVID-19. In these times, it is very important to adapt our hand-washing habits to ensure protection against the spread of COVID-19, while advocating for measures to reduce the risk of adverse reactions.

Keywords: Hand-Hygiene, Dermatological Changes, Skin, COVID-19, Nigeria

1. Introduction

The recommendation for regular hand washing and/or the use of hand sanitizers to prevent the spread of germs and diseases is receiving global attention. These hand hygiene measures are standard precautions for healthcare workers in healthcare facilities [1]. For the general population, however, this is a new and different way of life. The Coronavirus disease (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first identified in Wuhan, China in December 2019. The virus is known to be highly contagious and its spread can be curtailed through hand hygiene; which involves the practice of regular hand washing and the use of alcohol-based hand rub (ABHR) as recommended by the Centre for Disease Control and Prevention (CDC) [2].

The CDC recommends the use of hand sanitizers (containing over 60% ethanol-based alcohol, or 70% isopropyl alcohol) in addition to other prevention methods, as an

effective means of reducing the spread of coronavirus. Hand hygiene involves friction, rubbing, exposure to water, drying with a towel, use of surfactants and disinfectants; and they all have varying effects on the epidermal barrier. [3]

With the COVID–19 global pandemic and rising figures of infection in all regions of the world; the awareness of, and for hand hygiene is unprecedented. The result of frequent hand hygiene is the exposure of the skin to changes in skin physiology which cause dryness and irritation. [4-6] The repeated use of various agents (soaps, detergents, and hand sanitizers) can result in irritation and allergic reaction from any of the chemical constituents of hand hygiene products. The resulting skin inflammation and skin barrier disruption can cause an increase in transepidermal water loss, itching, redness, swelling, and an increase in disease transmission risk. [1, 5, 7] Measures can be taken to avert some of these problems by encouraging regular use of moisturizers following hand hygiene practices. [4, 8, 9]

A major reason among healthcare workers for poor compliance is skin irritation and the effects of repeated exposure to hand hygiene products and several studies have reported more hand dermatitis. [3, 10, 11-14] The epidermis, in particular the stratum corneum, acts as a barrier to infectious agents. Maintaining the integrity of the stratum corneum remains an important part of infection control and ultimately the success of the preventive measure of hand hygiene as one of the measures for curbing the spread of infection with Coronavirus (SARS- CoV-2). Hand hygiene guidelines recommend using lotions or creams to mitigate skin irritation and several studies support this. [3, 4, 10, 14-16] The advocacy for hand hygiene is more pronounced than ever and the practice of hand hygiene has been imbibed by all. Due to the nature of the products used for hand hygiene and the increase in hand washing and use of ABHR, there may be an increase in the prevalence of associated skin disorders. [4, 10]

It is therefore important to document the practices of individuals as well as the nature of skin changes resulting from measures taken to ensure adequate hand hygiene during the pandemic. The aim of this study was to assess the practice of hand hygiene among adult Nigerians during the COVID-19 pandemic and document any dermatological changes that may emanate from this preventive measure. It is hoped that the findings of this study can be used to advocate for protective measures following hand hygiene practices. Strategies that would help to improve the practice of appropriate and consistent hand hygiene for prevention of COVID-19 infection, and measures to mitigate skin changes that may occur will be encouraged.

2. Methods

This was a descriptive cross-sectional study conducted in Lagos, south-western Nigeria, the smallest and most populous State by landmass with 17,552,942 inhabitants. [15] A total of 502 adult residents of Lagos participated in this study. Data were collected by the use of a pre-tested, semi-structured, self-administered online questionnaire. The questionnaire consisted of 3 sections; the first was designed to collect information on the socio-demographic characteristics of the respondents, the second contained questions to assess the participant's practice of hand hygiene and the last section assessed the dermatological changes experienced by respondents. (Appendix 1) Data were analyzed using the Statistical Package for the Social Sciences version 23 (SPSS Inc., Chicago, IL, USA). Data were presented as frequencies, proportions, and means (± standard deviation). The practice of hand hygiene was scored based on the points obtainable from the practice items on the questionnaire and categorized into 'good practice' for scores above the mean score or 'poor practice' for scores below the mean. Bivariate analyses using the Chi-square or Fisher's exact tests and the independent t-test were used in determining the association between variables. Multiple linear regression analysis was done to determine the predictors of the dermatological effects of hand hygiene. The significance level was set at $p < 0.05$. Ethical approval (LUTH/HREC/EREV/0520) was obtained from the Health Research Ethics Committee (HREC) of the Lagos University Teaching Hospital (LUTH). Participation was voluntary, without consequences for non-participation. After reading the explanation of the nature of the study and its goals participants gave their consent by clicking 'agree' on the online survey form before proceeding to fill the questionnaire. Confidentiality was ensured and the data collected were used purely for this study.

3. Results

The mean age of the respondents was 40.5±12.5 years with most of the respondents (27.3%) between the age of 41 and 50 years. Women formed over half (67.3%) of them. The majority (97.2%) of respondents had achieved a tertiary level of education and a third (30.3%) of respondents personally attend to the hygiene and feeding of children under the age of five years (Table 1).

Table 1. *Socio-demographic characteristics of respondents.*

Variable	Frequency (n = 502)	Percentage (%)
Age range		
<21	22	4.4
21 – 30	104	20.7
31 – 40	119	23.7
41 – 50	137	27.3
51 – 60	94	18.7
Above 60	26	5.2
Mean ± SD 40.53 ± 12.50		
Sex		
Female	338	67.3
Male	164	32.7
Religion		
Christianity	454	90.4
Islam	41	8.2
Others	7	1.4
Level of education		
Non formal	2	0.4
Primary	1	0.2

Variable	Frequency (n = 502)	Percentage (%)
Secondary	11	2.2
Tertiary	488	97.2
Marital status		
Single	177	35.3
Married/Co-habiting	294	58.6
Widowed/Divorced	31	6.1
Occupation		
Professional	364	72.5
Skilled	52	8.4
Unskilled	34	6.8
Unemployed	62	12.3
Personally attends under 5s		
Yes	152	30.3
No	350	69.7

Over half of the respondents had good hygiene practices (Figure 1). The majority of the respondents (96.6%) did not experience a condition on the skin diagnosed by a doctor before COVID-19. Of those who had ever received a diagnosis of a skin condition, allergic dermatitis was the most frequent (27.8%), followed by eczema (22.2%) fungal infections, and whitlow (11.1% each). 22.7% had experienced atopic dermatitis, asthma, seasonal allergies, hay fever, or childhood eczema. About a third (33.3%) had experienced worsened skin conditions since COVID-19, while 35.3% applied a moisturizer or a barrier cream after hand hygiene (Table 2).

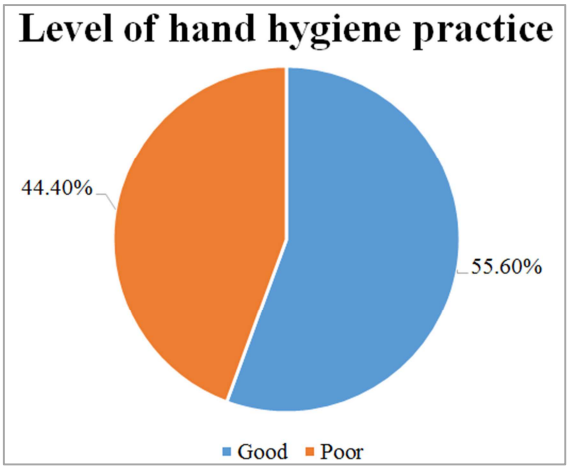

Figure 1. *Level of hand hygiene practice among adults in Lagos.*

Table 2. *Dermatological changes experienced by adults in Lagos as a preventive measure against COVID-19.*

Variable	Frequency (n = 502)	Percentage (%)
Had a condition on the skin of the hands diagnosed by a doctor in the past (before COVID-19)		
Yes	18	3.4
No	484	96.6
Past diagnoses of skin condition		
Allergic dermatitis	5	27.8
Contact dermatitis	1	5.6
Eczema	4	22.2
Fungal infection	2	11.1
Idiopathic guttate hypomelanosis	1	5.6
Psoriasis	1	5.6
Rashes	1	5.6
Systemic sclerosis	1	5.6
Whitlow	2	11.1
History of atopic dermatitis, asthma, seasonal allergies, hay fever or childhood eczema		
Yes	114	22.7
No	388	77.3
Worsened skin condition since COVID-19		
Yes	6	33.3
No	12	66.7
Applies moisturizing or barrier cream after practicing hand hygiene		
Yes	177	35.3
No	325	64.7

Also, 18.3% of respondents noticed changes in the skin since the start of practicing hand hygiene more frequently as a result of COVID-19. The most reported change was dryness of the hands (81.5%), roughness of the skin (25%), skin aging (19.6%), itching and peeling of the skin (18.5% each), cracks in the skin (14.1%) and scaly flaky skin (12%). Other skin changes were observed such as dry skin, thickening, rash, swelling, redness, blisters, burning sensation, and occasional bleeding. Regarding the pattern of skin changes, both hands were mostly affected (92.4%) followed by the right hand (6.5%) and then the left hand (1.1%). The back of the hand was the part mostly affected (45.6%), followed by both the palm and the dorsum (34.8%). The palm was exclusively affected in 19.6% of cases (Table 3).

Table 3. *Prevalence and patterns of skin changes observed with increased frequency of practicing hand hygiene since the COVID-19 pandemic.*

Variable	Frequency (n = 502)	Percentage (%)
Prevalence of observed skin changes		
Skin changes observed	92	18.3
No skin changes observed	410	81.7
Nature of skin change observed (multiple responses allowed)		

Variable	Frequency (n = 502)	Percentage (%)
Dryness	75	81.5
Roughness of the skin	23	25.0
Ageing of the skin	18	19.6
Itching	17	18.5
Peeling of the skin	17	18.5
Cracks in the skin	13	14.1
Scaly/Flaking skin	11	12.0
Darkening	9	9.8
Hardening/thickening	7	7.6
Rashes	5	5.4
Swelling	4	4.3
Redness	3	3.3
Blisters	3	3.3
Burning sensation	2	2.2
Occasional bleeding	1	1.1
Pattern of skin change		
Both hands	85	92.4
Right hand	6	6.5
Left hand	1	1.1
Part of the hand affected		
Back of the hand (dorsum)	42	45.6
Palm and the back of the hand	32	34.8
Palm	18	19.6

Age and marital status showed a statistically significant association with the level of hand hygiene practice (p=0.001, p<0.001 respectively) (Table 4). A greater proportion of females (21.9%) compared to males (11.0%) experienced dermatological changes with the use of hand sanitizers and this was statistically significant (p=0.003) (Table 5). However, the respondents' level of hand hygiene did not show a statistically significant association with the presence of worsening dermatological conditions (p=0.638) (Table 6).

Table 4. *Factors associated with respondents' level of hand hygiene practice.*

Variable	Level of Practice		X^2	P
	Good Freq (%)	Poor Freq (%)		
Age range				
<21	14 (63.6)	8 (36.4)		
21 – 30	44 (42.3)	60 (57.7)		
31 – 40	52 (43.7)	67 (56.3)	27.3	0.001
41 – 50	91 (66.4)	46 (33.6)		
51 – 60	64 (68.1)	30 (31.9)		
Above 60	14 (53.8)	12 (46.2)		
Sex				
Female	192 (56.8)	146 (43.2)	0.63	0.427
Male	87 (53.1)	77 (46.9)		
Religion				
Christianity	259 (57.1)	195 (42.9)		
Islam	17 (41.5)	24 (58.5)	4.16	0.125
Others	3 (42.9)	4 (57.1)		
Level of Education				
Non formal	0 (0.0)	2 (100.0)		
Primary	0 (0.0)	1 (100.0)	6.83	0.077
Secondary	9 (81.8)	2 (18.8)		
Tertiary	270 (55.3)	218 (44.7)		
Marital status				
Single	76 (42.9)	101 (57.1)		
Married/Co-habiting	184 (62.6)	110 (37.4)	17.71	<0.001
Widowed/Divorced	19 (61.3)	12 (38.7)		
Occupation				
Professional	203 (55.8)	161 (44.2)		
Skilled	21 (50.0)	21 (50.0)	0.70	0.874
Unskilled	20 (58.8)	14 (41.2)		
Unemployed	35 (56.5)	27 (43.5)		

Table 5. *Factors associated with dermatological changes experienced since COVID-19.*

Variable	Dermatological changes since COVID-19		X^2	P-value
	Yes Freq (%)	No Freq (%)		
Age range				
<21	3 (13.6)	19 (86.4)		
21 – 30	17 (16.4)	87 (83.6)		
31 – 40	21 (17.6)	98 (82.4)	2.40	0.791
41 – 50	25 (18.3)	112 (81.7)		
51 – 60	22 (23.4)	72 (76.6)		
Above 60	4 (15.4)	22 (84.6)		
Sex				
Female	74 (21.9)	264 (78.1)	8.79	0.003
Male	18 (11.0)	146 (89.0)		
Religion				
Christianity	82 (18.1)	372 (81.9)		
Islam	9 (22.0)	32 (78.0)	0.46	0.796
Others	1 (14.3)	6 (85.7)		
Level of Education				
Non formal	1 (50.0)	1 (50.0)		
Primary	1 (100.0)	0 (0.0)	6.47	0.090
Secondary	3 (27.3)	8 (72.7)		
Tertiary	87 (17.8)	401 (82.2)		
Marital status				
Single	30 (16.9)	147 (83.1)		
Married/Co-habiting	58 (19.7)	236 (80.3)	1.22	0.543
Widowed/Divorced	4 (12.9)	27 (87.1)		
Occupation				
Professional	68 (18.7)	296 (81.3)		
Skilled	7 (16.7)	35 (83.3)	1.37	0.711
Unskilled	4 (11.8)	30 (88.2)		
Unemployed	13 (21.0)	49 (79.0)		
Level of hand hygiene practice				
Good	53 (19.0)	226 (81,0)	0.19	0.664
Poor	39 (25.5)	184 (74.5)		

Table 6. *Association between respondents' level of hand hygiene practice and worsening of skin condition experienced before Covid-19.*

Variable	Worsened dermatological condition		X^2	P-value
	Yes Freq (%)	No Freq (%)		
Practice				
Good	2 (25.0)	6 (75.0)		*0.638
Poor	4 (40.0)	6 (60.0)		

4. Discussion

Following its outbreak, the alarming spread of COVID-19 has become a major global threat. Adults are one of the highly exposed groups and are more likely to acquire this disease. The mean age of respondents in this study was higher than that reported in an Ethiopian study where the mean age was reported to be 28.69 (SD ± 4.048) years. [17]

This study showed that 55.6% of the respondents had good hand hygiene practices during COVID-19. This finding is lower than reports from Ethiopia (76%) and Saudi Arabia (61%). [17, 18] This could be because of the difference in the study area as it relates to socio-cultural characteristics and implementation of the related health program, and also the fact that the aforementioned studies were among healthcare workers. More females reported skin changes with alcohol-based hand rub use, probably because they may be more observant and are reportedly more conscious of their skin than their male counterparts. [19] It may also be because females in the study area may have more contact with wet work due to house chores, cooking and caring for children, thereby exposing them to allergens and/ or irritants.

A large number of respondents attained tertiary education and were professionals (97.2% and 72.5% respectively). This skewed distribution may be a result of the study tool employed. The Google form requires respondents to be literate and have a fair knowledge of information technology use and internet services. This study also highlighted the preferred product for practicing hand hygiene was alcohol-based hand rub (79%). This is much lower than the findings from Ethiopia in which 95.8% of the respondents also used alcohol-based hand rub. Frequent use of alcohol- based hand rubs can result in skin dryness and irritation, though allergy against alcohol is unknown and allergic contact dermatitis attributable to other compounds added to alcoholic hand gel is extremely rare, as illustrated in a 10 year hospital based study in Switzerland. [20] This however, was refuted by an American study involving major sanitizers used by healthcare workers that found only four of them were free

from all the allergens listed in the 2017 Core Allergen Series of the American Contact Dermatitis Society. [21] This may explain the skin changes seen in this study as alcohol- based hand rub was the preferred mode for hand hygiene.

Skin changes were observed in 18.3% of the respondents in our study, which is lower than some other studies done on healthcare workers who are more predisposed to hand eczema. [22, 23] Skin dryness (81.5%) is the most reported adverse effect which is similar to a study in Ethiopia [17] in which 62.5% reported skin dryness. It is also the highest adverse effect in a study in Thailand. [23] Repeated use of soaps, detergents, solvents and other substances used for domestic cleaning which are weak irritants are usually very well tolerated initially. However, repeated exposure to these substances can lead to chronic cumulative irritant contact dermatitis, mainly due to their ability to remove skin surface lipids, damage skin proteins, denature epidermal keratin, and even induce alteration of the cell membrane of keratinocytes. [24] Individuals with a personal or family history of atopic dermatitis have a chronically dysfunctional cutaneous barrier that increases their sensitivity to skin irritants. [25] This is supported by findings in our study where 22.7% had a family history of atopic dermatitis and other dermatological conditions. It is possible that this is the reason for respondents (18.3%) who noticed skin changes since the onset of frequent hand hygiene for the prevention of COVID-19.

The dorsum of the hands were reportedly more affected than the palmar aspect in this study and this is in keeping with findings in hand dermatitis, where the palms are less prone to irritant contact dermatitis. [19, 22, 26] The severity of dermatitis produced by an irritant depends on the type of exposure, vehicle, and individual propensity. Normal, dry, or thick skin is more resistant to irritant effects than moist, macerated, or thin skin. Cumulative irritant dermatitis most commonly affects thin exposed skin, such as the back of the hands and the webspaces of the fingers. [26]

Both hands were affected in 92.4% of those who had observed any skin changes since the start of the pandemic. This is informative and buttresses the effect of proper hand hygiene where both hands are rubbed together with alcohol based hand rub for at least 20 seconds and with soap and water for at least 30 seconds per wash. [4] This prolonged contact time increases exposure of the skin to the irritants or allergens with resultant inflammation. The dominant hand is more often affected in unilateral hand dermatitis when in contact with a potential culprit allergen. [19, 26]

Other constituents in commercially available soaps and hand sanitizers include fragrances, preservatives and dyes. Though these were not specifically documented in this study, they are known to cause both irritant and allergic contact dermatitis associated with prolonged water exposure or wet work. It is not surprising that about 18.5% of respondents described features of inflammation with itching and peeling of the skin of the hands.

Skin dryness being the most common dermatological manifestation reported could be due to the small number of respondents that applied moisturisers and barrier protection creams. Applying moisturizing skin care products after hand cleansing is the essential step in keeping the skin hydrated and preventing further abnormal skin reactions, particularly immediately after hand washing. [26] These hydrating products should be liberally applied, multiple times.

5. Limitations

The study requested information based on the recall of respondents with respect to a known dermatoses. There is a likelihood that this would have been prone to errors. The respondents may also not adequately identify skin changes to be ticked on the forms.

6. Conclusion

Many adults practiced good hand hygiene since the start of practicing hand hygiene more frequently, as a result of COVID-19. Presently, it is important to adapt hand hygiene practices that ensure protection against COVID-19 and its spread; yet ensuring there is a reduced risk of developing cutaneous adverse reactions from this measure. Promoting moisturizing following hand hygiene, the use of fragrance free moisturisers, and low allergenic alcohol-based hand rubs should be encouraged.

Appendix

Google Form https://docs.google.com/forms/Response

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