

Dorsal Phalangeal Hair Distribution in Hands of Citizens of Almadinah Almonawarah Region, Saudi ArabiaYasser M. Elbastawisy*^{1,2} and Abeer A. Eltoraby³¹Department of Anatomy, Faculty of Medicine, Taibah University, Saudi Arabia²Department of Anatomy, Faculty of Medicine, Mansoura University, Egypt³Dermatologist, Elsinbellaween General Hospital*E-mail: yasserbast@yahoo.com

Abstract: Introduction: Hairiness in humans has been attracting the attention of anthropologists for a long time. Many investigators studied hair growth over the body including the axillary hair, pubic hair and the hair on the phalanges of the fingers. They tried to study the racial, geographical and sexual variations in hair pattern in different populations. **Aim of the work:** The present investigation aimed to study the different patterns of dorsal phalangeal hair distribution in citizens of Almadinah Almonawarah region in Saudi Arabia and to determine the existence of sexual dimorphism. **Subjects and Methods:** 600 contributors (300 males and 300 females) aging 18-36 years were randomly selected from medical and paramedical Saudi students and employee of Taibah University, Almadinah Almonawarah. Their clean hands were examined under adequate lighting for dorsal phalangeal hair distribution using hand lens. The collected data were statistically analyzed. **Results:** The present study showed that no difference in dorsal phalangeal hair distribution between the right and left hands in the same sex. Also, hair was absent on the dorsum of the distal phalanges in all participants. Hair was present on the dorsum of the proximal phalanges of 98.67% of males and 97.33% of females. The most common combination of fingers with proximal phalangeal hair was 12345 while, the least common combination was 45 in males and 234, 45 and 4 in females. Hair was present on the dorsum of the middle phalanges of 46% of males and 38% of females. The most common combination of fingers with middle phalangeal hair was 34 while the least common combination was 5 in males and 45 in females. Dorsal phalangeal hair distribution showed no significant difference between male and female contributors. **Conclusion:** Based on the previous data, it is recommended to widen the scale of similar future researches to cover a larger number of population in different regions of the Kingdom of Saudi Arabia.

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1.Introduction:

Hairiness in humans has been attracting the attention of anthropologists for a long time. While all the mammals evolutionally close to humans have fur (hairy skin), humans are “naked monkeys”. The reason for this loss of hair has not been vividly elucidated. The phalanges of the hand also follow the evolutionary hominid trend of progressive hair loss. While man’s ancestors had hair on all their fingers, studies on human subjects have shown that the distal phalanges have almost no hair; the proximal ones almost always have hair which can occasionally be present on the middle phalanges (Nesic et al., 2010).

Eckes (1987) studied hair growth over the entire body including the axillary and pubic hair and the hair on the middle phalanges of the fingers. The latter has a special place in the genetic process of hair regression as a whole. The author added that, body hair is one of the characteristics that varies markedly with ethnic type. Phalangeal hair distribution was first studied by Danforth (1921). Then, many investigators tried to study the racial, geographical and sexual variations in hair pattern in different populations such as Brazilians

(Saldanha and Guinsburg, 1961), Indians (Dutta, 1963), Gorkhas (Parmer, 1968), Tibetans (Tiwari and Bhasin, 1969), Africans (Singh, 1982, Mbajjorgu, 1996, Olabiyi et al., 2008) and Europeans (Henke and Pålsson, 1979, Luna, 1989, Vona and Porcella, 1989). Hair distribution on the dorsum of phalanges of hand shows a wide variation in relation to race, nationality and ethnic groups. So, it is of medico legal and anthropological importance (Egesi and Rashid, 2010, Onyije and Oyibo, 2011).

A review of the available literature revealed a lack of the studies pertaining dorsal phalangeal hair distribution in Saudi Arabia. Consequently, the notion of the present investigation arose and was accomplished with an intent to shed light on the different patterns of dorsal phalangeal hair distribution in natives of Almadinah Almonawarah province in Saudi Arabia and to determine the existence of sexual dimorphism. To our knowledge this was the first study to describe hair distribution in people of Almadinah Almonawarah province in Saudi Arabia.

2. Subjects and Methods:**Participants:**

The current investigation was achieved on a population sample of male (300) and female (300), medical and paramedical Saudi students and employee of Taibah University, Almadinah Almonawarah region, Saudi Arabia. Their ages ranged between 18 – 36 years. All contributors were citizens of Saudi Arabia, born to Saudi parents and living at Almadinah Almonawarah region. Name, age and sex of each individual were recorded. Subjects with skin disease, hand trauma or congenital anomalies were excluded from the study. Participation in this work was optional and all participants signed informed consent statements prior to the study that was accepted by the Saudi University ethics committee.

Method:

Phalangeal hair observation was done by close inspection of the clean hands under adequate lighting against a dark background by using a magnifying glass (hand lens) (**Fig. 1**). The fingers with empty follicles and those with hair were both recorded as the fingers with hair. The observations were recorded together with the personal data (name, age and parental origin). Both hands of each contributor were examined. The phenotypes were determined through the observation of the presence or absence of hair or follicles on the dorsum of the phalanges of the finger combinations according to modified Bernstein classification (**Bernstein, 1949**):

- 0: no hair on any of the phalanges.
- 1: hair present on the thumb.
- 2: hair present on the index finger.
- 3: hair present on the middle finger.
- 4: hair present on the ring finger.
- 5: hair present on the little finger.
- 45: hair present on the ring and little fingers.
- 345: hair present on the middle, ring and little fingers.

234: hair present on the index, middle and ring fingers; etc.

Data were collected, tabulated and statistically analyzed using “Statistical Package for the Social Sciences (SPSS) version 13.0 program (SSPS, Inc., Chicago). Differences in hair distribution between male and female were subjected to Mann-Whitney test for significance. A P-value <0.05 was accepted as statistically significant according to the formula of Daniel (**Daniel, 1987**).

3.Results:

For the same sex in the present study, phalangeal hair distribution revealed no difference between the right and left hands. Also, hair was absent on the dorsum of the distal phalanges in all male and female participants.

In the present study hair distribution on the dorsum of proximal phalanges of the hands of both male and female participants is shown in **Table (1) and graph (1)**. Hair was present on the dorsum of the proximal phalanges of 98.67% of males and 97.33% of females. The most common combination of fingers with proximal phalangeal hair was 12345 (55% and 48% in males and females respectively), followed by the 2345 combination (39% and 46.67% in males and females respectively). The least common combination in males was 45 (0.33%) while in female hands the least combinations were 234, 45 and 4 (0.33% for each). The combination 4 showed proximal phalangeal hair in female participants (0.33%) but it was lacking in males. On the other hand the combination 23 showed proximal phalangeal hair in 0.67% of males but it was absent in females. No significant difference between male and female contributors ($P = 0.595$).

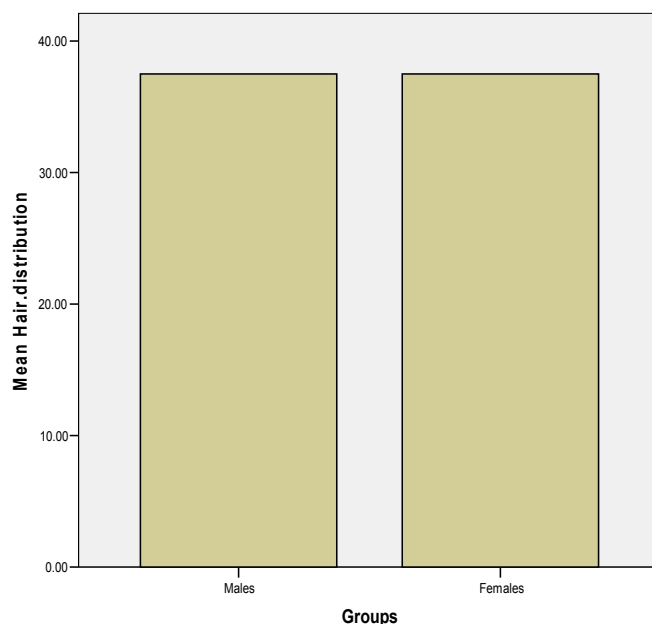
Hair distribution on the dorsum of middle phalanges of the hands of both male and female participants in the present study is shown in **Table (2) and graph (2)**. Hair was present on the dorsum of the middle phalanges of 46% of males and 38% of females. The most common combination of fingers with middle phalangeal hair was 34 (13.33% and 14% in males and females respectively), followed by the combination 4 (11.67% and 11% in males and females respectively). The least common combination in males was 5 (1%) while in female hands the least combination was 45 (0.33%). No significant difference between male and female contributors ($P = 0.622$).



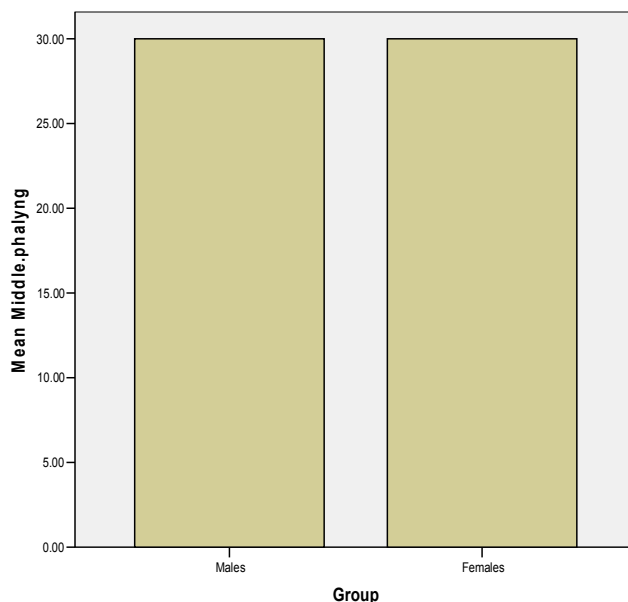
Fig. (1): hand examination for dorsal phalangeal hair using magnifying hand lens.

Table (1): *Distribution of proximal phalangeal hair in male and female Saudi contributors.*

Combinations	Male (300)	Female (300)	Total (600)
12345	165 (55%)	144 (48%)	309 (51.5%)
2345	117 (39%)	140 (46.67%)	257 (42.83%)
345	6 (2%)	3 (1%)	9 (1.5%)
234	3 (1%)	1 (0.33)	4 (0.67%)
34	2(0.67%)	2 (0.67%)	4 (0.67%)
23	2 (0.67%)	0 (0%)	2 (0.33%)
45	1 (0.33%)	1 (0.33%)	2 (0.33%)
4	0 (0%)	1(0.33%)	1 (0.17%)
0 (absent)	4 (1.33%)	8 (2.67%)	12 (2%)

**Graph (1):** *Distribution of proximal phalangeal hair in male and female Saudi contributors.***Table (2):** *Distribution of middle phalangeal hair in male and female Saudi contributors.*

Combinations	Male (300)	Female (300)	Total (600)
3-4	40 (13.33%)	42 (14%)	82 (13.67%)
4	35 (11.67%)	33 (11%)	68 (11.33%)
3-4-5	27 (9%)	18 (6%)	45 (7.5%)
2-3-4-5	15 (5%)	2 (0.67%)	17 (2.83%)
3	5 (1.67%)	6 (2%)	11 (1.83%)
2-3-4	4 (1.33%)	5 (1.67%)	9 (1.5%)
3-5	4 (1.33%)	3 (1%)	7 (1.17%)
5	3 (1%)	4 (1.33%)	7 (1.17%)
4-5	5 (1.67%)	1 (0.33%)	6 (1%)
0 (absent)	162 (54%)	186 (62%)	348 (58%)



Graph (2): *Distribution of middle phalangeal hair in male and female Saudi contributors.*

4. Discussion:

Certain studies have demonstrated that sometimes populations of different origin and geographical location share the same frequency features. For instance, individuals of Irish origin have less expressed hairiness than other Northern Europeans, while the Italians have even less hairiness, especially if the hair is dark. The population of Sardinia has a markedly lower frequency of individuals with hair on the middle phalanx compared to the Mediterranean and other European populations (Vona and Porcella, 1989). Female members of the Murcia population from Spain demonstrate an extremely low frequency of middle phalyngeal hair (Esteban and Fananas, 1992), while a comprehensive study of the southern Spanish population did not show any differences that were either bimanual- or gender-related (Luna, 1989). The current study was accomplished to elucidate the different patterns of dorsal phalyngeal hair distribution in Saudi natives of Almadinah Almonawarah province in Saudi Arabia and to detect the existence of sexual dimorphism.

The present study showed that hair distribution on the dorsum of the proximal and middle phalanges was symmetrical in both hands for the same subject. This could be attributed to similar development of hair follicles on both sides. Our findings contradicted that reported by Nesic et al. (2010) who claimed that there is an asymmetry in hair distribution between the left and right hands in both sexes. However, our result came in accord with Mbajiorgu et al. (1996) who claimed that hair on the fingers is symmetrically

distributed, with minor deviations due to temporary shedding or intentional removal, leaving the follicles temporarily invisible. The existing work revealed that hair was lacking on the dorsum of the distal phalanges in all male and female participants. This could be owed to failure of development of hair follicles on the dorsum of the distal phalanges. Such a finding simulated that reported by Dharap et al. (1995) and Olabiya et al. (2008). In addition, Nesic et al. (2010) attributed absence of hair to a simple autosomal-recessive mechanism.

In the current investigation, hair was present on the dorsum of the proximal phalanges of 98.67% of males and 97.33% of females. This observation could carry hormonal background and was similar to that of Jang et al. (2001) on Koreans. The most common combination of proximal phalangeal hair in the present study was 12345 (51.5%). This combination was found to be the most common in Turks (71.6%) (Hatiboglu 1983) and in South Indians (53.5%) (Sangam et al. 2012). In our study the 2nd most common combination was 2345 (42.83%). Meanwhile, Onyije and Oyinbo (2011) alleged that this combination is the commonest in Nigerians (65%). The least common combination of proximal phalangeal hair in the present investigation was 4 (0.17%). On the contrary, Sangam et al. (2012) announced that 234 is the least common combination (0.2%) in South Indians. These variations could be attributed to racial and /or environmental afflictions.

The present study exhibited that the middle phalangeal hair is absent in 58% of contributors. This was, more or less, similar to observations delivered by

Parmar (1968) in Japanese (56%), **Sangam et al. (2012)** in South Indians (57.2%) and **Onyije and Oyinbo (2011)** in Nigerians (89.1%). The common combination of fingers with middle phalangeal hair in the present study was 34 (13.67%) followed by 4 (11.33%) and 345 (7.5%). This simulated the findings of **Hatiboglu (1983)** and **Sangam et al. (2012)** but differed from those of **Mbajiorgu et al. (1996)**, who observed that 345 pattern was more common in Nigerians. In the present study 2345 combination of finger with middle phalangeal hairs was more common in male (5%) as compared to that in females (0.67%). These findings were consistent with those of **Hatiboglu (1983)** in South Indians. Again, the shadow imparted by hormones, race and /or environment could be accused for the observed variations. **Nesic et al. (2010)** and **Onyije and Oyinbo, (2011)** hypothesized that hair distribution on the phalanges is genetically determined and follows the Mendelian law of inheritance. Complete absence of phalangeal hair is a recessive trait while the presence of hair on greater number of fingers is considered as a dominant character. However, there has no general agreement about the exact manner of transmission of this characteristic. Hairiness is determined by at least 5 allelic genes (A0, A1, A2, A3, and A4). Individuals without middle phalangeal hair are the carriers of two recessive genes for individual alleles. **Olabiyyi et al. (2008)** added that not only the sex hormones but also the environmental conditions influence the phalangeal hair distribution. In conclusion, in light of the demonstrated findings in the current study, it is recommended to widen the scale of a similar future research to cover a larger number of population in different regions of the Kingdom of Saudi Arabia.

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