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Research Article

Prevalence of Palmaris Longus Muscle Absence among the Hausa Ethnic Group in Northern Nigeria

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ABSTRACT
The prevalence of the palmaris longus (PL) muscle varies significantly among global populations, including within Nigeria. Understanding its absence in specific ethnic groups, such as the Hausa, provides insights into anatomical variation, population genetics, and evolutionary biology. This study investigated the frequency distribution of sex and age among participants, the prevalence of PL muscle absence, its distribution by limb and sex among individuals of Hausa ethnicity. A total of 300 Hausa participants (150 males and 150 females) were examined using standardized clinical tests. Data collected included age, sex, and presence or absence of the PL muscle in each forearm. Data was presented as frequencies and percentage and bar charts. The age group 18–22 years represented the highest proportion (37%), followed by 23–27 years (26.7%), 28–32 years (20.3%), 33–37 years (8.7%), and 38–42 years (7.3%). The overall prevalence of PL absence was 8.3% (25 participants). Unilateral absence was observed in 21 participants (12 on the right and 9 on the left), while bilateral absence was found in 5 individuals. Among males, PL absence was observed in 16 participants (5.33%) and in 9 females (3.00%). Bilateral absence was more prevalent in males (1.33%) compared to females (0.33%). This study establishes the prevalence of PL absence among the Hausa population as 8.3%, with notable differences in bilateral absence between sexes. This knowledge is vital in the planning of surgeries in the arm and muscles grafting with PL serving as donor.

Keywords: Africa; Hausa; Muscle Grafting; Palmaris Longus; Prevalence

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INTRODUCTION

The palmaris longus (PL) is a slender, fusiform forearm muscle considered phylogenetically regressive and highly variable in form and presence. It originates from the medial epicondyle of the humerus via the common flexor tendon and inserts into the palmar aponeurosis after traversing the flexor retinaculum (Nasiri *et al.,* 2016; Isidro *et al.,* 2020). It typically has a short muscle belly and a long tendon. Among all forearm muscles, the PL exhibits the most variability, particularly in its presence, morphology, and bilateral symmetry (Georgiev *et al.,* 2017).

The absence of PL was first documented in 1559 (Kular *et al*., 2019). It may be unilaterally or bilaterally absent and its absence is often asymptomatic. Prevalence varies widely depending on population group, sex, and side, ranging from 1.5% to 63.9%, with a global average of approximately 10% (Sebastin & Lim, 2006; Standring, 2008; Ioannis *et al*., 2015).

Although not essential for normal upper limb function, the PL is frequently harvested for

reconstructive procedures due to its superficial location, long tendon, and minimal morbidity at the donor site. It is used in tendon grafts for flexor tendon reconstruction, ptosis repair, facial reanimation, and plastic surgeries involving the lips and chin (Thompson *et al.,* 2001). While agenesis typically does not affect hand function, rare cases have been linked to nerve entrapment syndromes, particularly involving the median or ulnar nerve (Georgiev *et al*., 2017).

Despite the anatomical and clinical significance of the PL muscle, limited studies exist regarding its prevalence in indigenous African populations, particularly the Hausa, who represent the largest ethnic group in Nigeria. This study pursues to determine the prevalence and pattern of PL muscle absence among the Hausa ethnic group in Kano State, Nigeria. The PL muscle demonstrates various anatomical forms, such as being tendinous proximally and muscular distally, muscular centrally with tendons on either ends, or two muscle bellies separated by a central tendon. However, the most frequent variation is complete agenesis, more commonly reported on the left side. Globally, absence rates range from 1.5 % to 63.9%, with the highest variations noted among Caucasian and East Asian populations. Little data exists on this variation among the Hausa, thereby justifying the present study (Ioannis *et al*., 2015).

MATERIALS AND METHODS

Study Location

This study was conducted in Kano State, located in northern Nigeria. The region has an annual rainfall of less than 100 cm, with a prolonged dry season from October to April and a rainy season from May to September. Average temperatures range from 24°C to 27°C but may reach 38°C. Kano is the most populous Nigerian state, with an estimated population of 9.38 million. The metropolitan area includes six local government areas: Tarauni, Kano Municipal, Fagge, Dala, Gwale, and Nassarawa, encompassing an urban population of approximately 2.16 million (Iloeje, 2001; Barau, 2007).

Study Population

A total of 300 participants of Hausa ethnicity (150 males and 150 females) aged 18 to 50 years were selected using random sampling techniques.

Ethical Approval and Consent

Ethical approval was obtained from the Human Anatomy Department Ethical Committee at Northwest University, Kano. Written informed consent was obtained from all participants prior to data collection.

Questionnaire

A structured questionnaire was administered to collect demographic data, medical history, and information regarding PL muscle presence.

Physical Examination

Standardized clinical tests were used to assess the presence of the PL muscle in both forearms:

Schaeffer's Test: Opposition of the thumb to the little finger followed by wrist flexion.

Thompson's Test: Participant makes a fist, flexes the wrist, and flexes the thumb over the fingers.

Mishra's Test I: Metacarpophalangeal joints are passively hyperextended while the participant actively flexes the wrist.

Mishra's Test II: Participant abducts the thumb against resistance with the wrist in slight palmar flexion.

These tests were conducted as described in Kayode *et al.* (2008) and confirmed by visual and manual inspection.

Data Analysis

Data were analyzed using SPSS version 20.0. Descriptive statistics were used to present age, sex, and PL absence data. Prevalence was calculated as the proportion of individuals exhibiting absence of the PL muscle. Chi square test was used to check for association between sex and absence of palmaris longus

RESULTS

Sex and Age Distribution of Participants

Table 1 shows that out of the 300 participants, the distribution by sex was equal, 150 males (50%) and 150 females (50%). The age distribution was as follows: 18–22 years: 111 participants (37%), 23–27 years: 80 participants (26.7%), 28–32 years: 61 participants (20.3%), 33–37 years: 26 participants (8.7%) and 38–42 years: 22 participants (7.3%).

Frequency Distribution of the Present and Absent of Palmaris Longus among Hausa Ethnic Group

Table 2 shows Frequency distribution of the Present and absent of palmaris longus among Hausa ethnic group. It was observed that overall prevalence of

absence of Palmaris longus was 8.3% (25 participants out of 300 participants).

Table 1: Frequency distribution of the sex of the participants

Sex	Frequency (n)	Percent %)	Cumulative Percent
Male	150	50.0	50.0
Female	150	50.0	100.0
Total	300	100	100.0

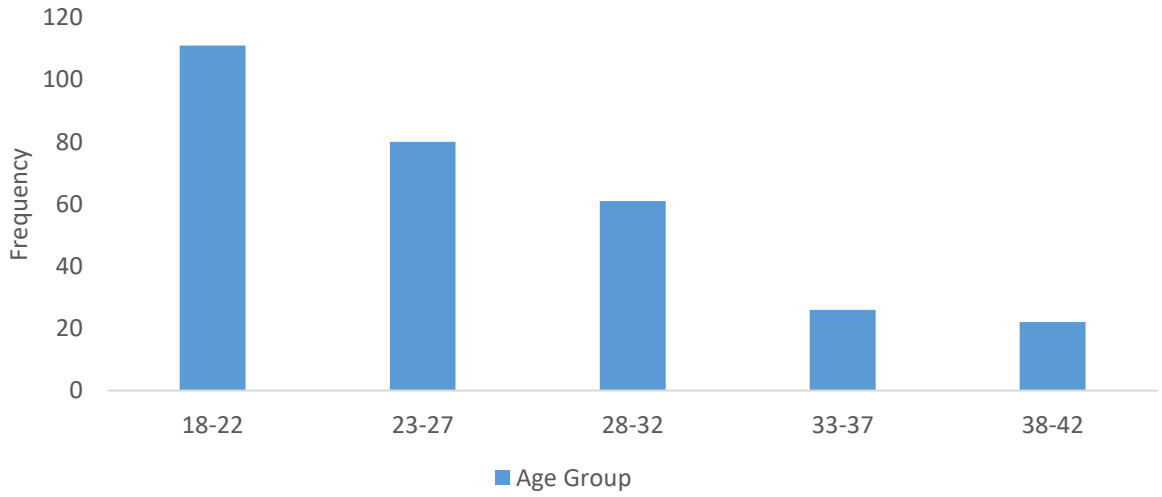

Figure 1. Frequency distribution of the Age group of the participants

Table 2. Frequency distribution of the Present and absent of palmaris longus among Hausa ethnic group

Variables		Frequency	Percent	Cumulative Percent
Palmaris Longus	Present	275	91.7	91.7
	Absent	25	8.3	100.0
	Total	300	100.0	

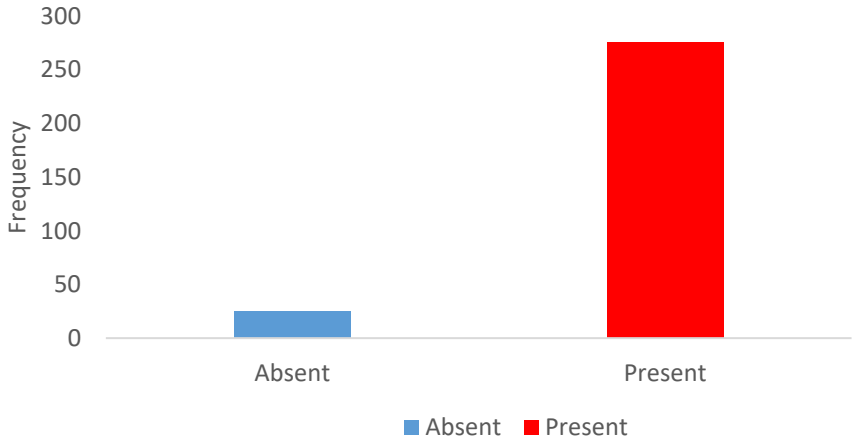

Figure 2. Frequency distribution of the presence of palmaris longus among Hausa ethnic group

The Distribution of Palmaris Longus Absence on Both Sexes

Table 3 shows the distribution of Palmaris longus absence by sex. It was observed the total (i.e. both sexes combined) absence of palmaris longus (PL) was 25 participants (8.33%). In males, PL was found to be absent in 16 participants (5.33%) while in female PL was found to be absent in 9 participants (3.00%).

The distribution of palmaris longus absence on both limbs

The total distribution on the right and left were 12 (4.00%) and 9 (3.00%) respectively. Bilaterally the absent of this muscle was in 5 participants (1.67%). The total incidence of absence in males right unilateral was 7 participants (2.33%) while for the female was 5 participants (1.67%). The distributions on the left male and female were 5 participants (1.67%) and 3 participants (1.00%) respectively. However, Bilateral distributions on the male and female were 4 participants (1.33%) and 1 participant (0.33%) respectively see Table 4.

Association between sex and absence of palmaris longus

Pearson Chi square test showed that the association between absence of palmaris longus and sex not to be statistically significant X(1) = 2.138, p = 0.144 see Figure 3 and Table 3.

Table 3. The distribution of palmaris longus absence on both sexes

Sex	Frequency	Percentage (%)
Male	16	5.33
Female	9	3.00
Total	25	8.33

Table 4. The distribution of palmaris longus absence on both limbs

Absence of PL	Right	Left	Bilateral
Male	7 (2.33%)	5 (1.67%)	4 (1.33%)
Female	5 (1.67%)	3 (1.0%)	1 (0.33%)
Total	12 (4.0%)	9 (3.0%)	5 (1.67%)

PL: Palmaris Longus

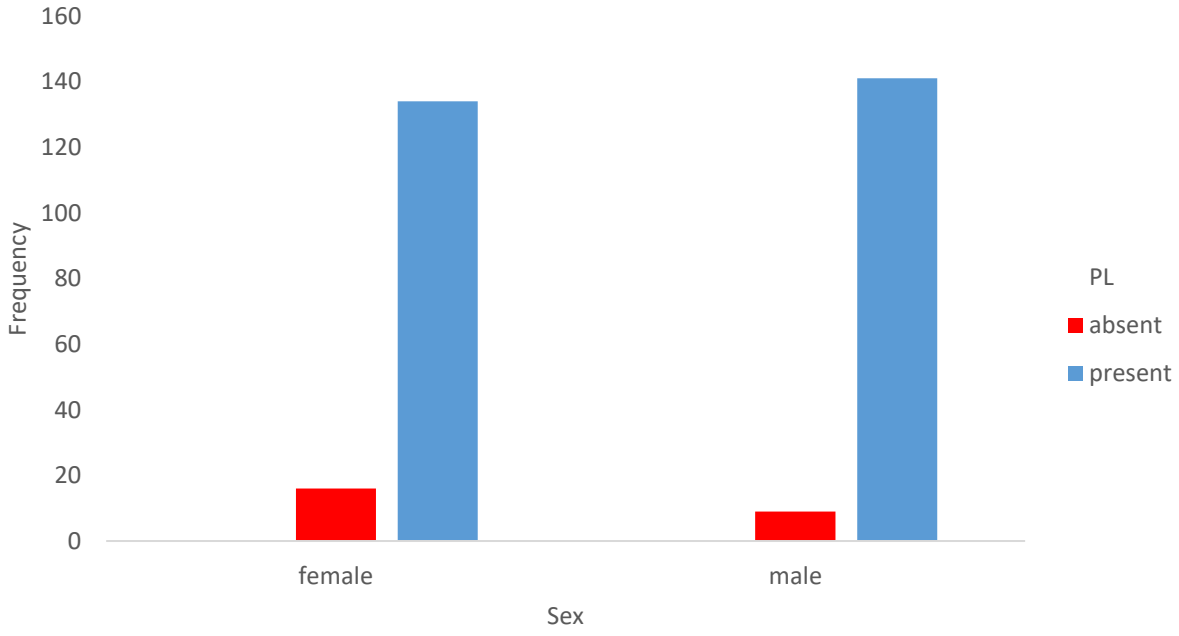

Figure 3: Distribution of palmaris longus by sex

DISCUSSION

The palmaris longus (PL) is a slender and variably present forearm muscle, considered to be undergoing phylogenetic degeneration. It originates from the medial epicondyle via the common flexor tendon and adjacent intermuscular septa. A notable anatomical feature of the PL is its short muscle belly and long tendon (Nasiri *et al*., 2016).

In this study, demographic characteristics were analyzed based on age and sex. A balanced gender distribution was achieved, with equal representation of male and female participants (50% each). The largest proportion of participants (37%) were within the 18–22 years age group, indicating predominance of young adults. Conversely, the lowest representation (7.3%) was found in the 38–42 years group.

This sampling contrasts with several other studies that included more varied age ranges and sample sizes. Mbaka and Ejiwunmi (2009) studied 600 subjects aged 8–60 years, consisting of 335 males and 265 females. Similarly, Oviosun *et al.* (2023) reported a participation rate of 91% among 294 medical students, with 57.6% females and 42.4% males.

The PL muscle is widely recognized for its high anatomical variability. Among its variations, complete absence is the most frequently reported anomaly (Oviosun *et al*., 2023). The present study investigated the prevalence of PL absence in individuals of Hausa ethnicity and found an overall absence rate of 8.3%, with 25 out of 300 participants lacking the muscle. This finding aligns closely with studies in Malaysia (9.3%; Roohi *et al*., 2007), Iran (10.2%; Lahiji *et al.,* 2013), and South Africa (11.5%; Ndou *et al.,* 2010).

Comparatively lower prevalence rates have been reported in other African and Asian populations: Ghana 3.8%; Ableduu & Offei (2014), Korea 4.1%; Kyung *et al*. (2012), East Africa 4.4%; Kigera & Mukwaya, 2011), and among the Yoruba ethnic group in Nigeria 6.7%; Mbaka & Ejiwunmi (2009). In contrast, higher prevalence rates have been observed in studies from, India 17.2–28%; Sebastin *et al*., 2005; Kapoor *et al*., 2008; Devi Sanka *et al.* (2011), Saudi Arabia 40.5%; Alabbad *et al.* (2018), and Turkey 63.9%; Ceyhan & Mavt (1997), indicating a higher absence of the muscles among the white caucasians.

Bilateral absence was found in 1.67% of our study population. This finding is comparable with previous reports: 1.1% by Kigera & Mukwaya (2011), 2.9% by Roohi *et al.* (2007), and 1.5% by Mbaka & Ejiwunmi (2009). However, higher bilateral absence rates were noted in studies by Lahiji *et al.* (2013), 6.7% and Adejuwon *et al*. (2012), 13.7%.

Gender differences in PL absence were also observed. Bilateral absence was more common among males (1.33%) than females (0.33%), suggesting potential sex-linked genetic or anatomical factors. This study also found out that the absence of palmaris longus muscle does not sexual variation even though the prevalence was higher in males. This finding is in line with Kyung *et al*. (2012) also found a higher rate in males (4.7%) compared to females (3.3%), though not statistically significant. Conversely, Roohi *et al*. (2007) and Cetin *et al.* (2013) reported a higher frequency of absence in females. Salwa (2015) found no statistically significant difference in absence based on gender or side of the body.

In this study, unilateral absence was more frequent on the right side in both males (2.33%) and females (1.67%) compared to the left. This finding aligns with Lahiji *et al.* (2013), who also found higher absence on the right (10.2%) than the left (5.9%). However, other studies report either no side predilection (Adejuwon *et al.,* 2012) or a higher absence on the left side (Alves *et al*., 2011; Ableduu & Offei, 2014). This study is limited in scope with limitation ranging from sample size, age spread of the sample and the use of limited inferential statistics

CONCLUSION

The study concludes that palmaris longus muscle is absent in 8.3 % of the Hausa population of Northern Nigeria with higher absence in the females than the males. However, absence in the right hand is higher in the male population. These variations point to genetic and developmental effects unique to the Hausa ethnic group but also which is consistent with anatomical variations seen globally. This study also points out the significance of the knowledge of the variations in the arm during surgical planning and tendon or muscle grafting procedures given its moderate absence (8.3%) in the Hausa Ethnic group. This study highlights the need for further studies employing larger samples and diverse ethnicities of Northern Nigeria and the use of alternative modalities of assessing the absence of the muscle such as by using hospital archives of imaging techniques capturing the arm.

Conflict of Interest

The authors declare no conflict of interest

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