**ORIGINAL ARTICLE**

# THE PREVALENCE OF ABSENCE OF PALMARIS LONGUS MUSCLE IN MALE AND FEMALE MEDICAL STUDENTS OF PUNJAB: AN INSTITUTIONAL STUDY

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## ABSTRACT

**Background:** Palmaris longus is a weak flexor muscle located in the anterior compartment of the forearm. Its presence in this compartment is frequently varied since it belongs to the superficial group of muscles. Its absence is observed in several communities throughout the world, with prevalence varying from 2.2% to 63.9%, depending on ethnicity, gender, and side of the body (laterality). Because it is a weak flexor of the wrist joint, it is employed in cosmetic and reconstructive surgeries.

**Objectives:** To investigate the prevalence of Palmaris Longus muscle absence in the Punjabi community when compared to other communities throughout the world.

**Methods:** After receiving clearance from the FMH College of Medicine and Dentistry's IRB (Intuitional Review Board), cross-sectional research was done to assess the absence of the Palmaris Longus muscle in FMHCM & D students. A total of 447 students were admitted to the study from various classes of MBBS, BDS, and Allied Health Sciences. Among these pupils, 133 were male and 314 were female. All selected candidates were given the usual Schaeffer's test, which was supplemented by the Thompson and Mishra tests.

**Results:** Palmaris Longus (PL) was absent in 9 candidates, accounting for 2% of the total 447 students. Four of these (0.89%) were men, and five (1.11%) were women. Absence was reported by 3% of male pupils and 1.5% of female students. Individual right and left arm agenesis were also seen. Male students had three right arm absences and one left arm absence out of a total of four. On the other hand, among female candidates, right arm agenesis was detected in all five individuals, whereas left arm agenesis was seen in none.

**Key Words:** Palmaris longus, agenesis, prevalence.

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## INTRODUCTION

Palmaris longus is a weak flexor muscle located in the forearm's anterior compartment.[1] The muscle originates from the common flexor tendon, which is inserted on the humerus' medial epicondyle.[2] Splitting of palmaris longus occurs distally

in the palm, results incorporation in longitudinally oriented fibers of palmar aponeurosis.[3] Palmaris longus (PL) fundamentally supports the skin and fascia of the hand, resisting horizontal shear stress in the distal direction. It also helps to tighten the palmar aponeurosis.[4]

The anatomical differences of the palmaris longus muscle have been widely described, including its origin, insertion, and absence in various individuals throughout the world[5,6] Palmaris longus has little functional usage in the human upper limb.[7] As a result, palmaris longus is regarded a dispensable muscle since its absence has no effect on wrist or hand function.[8] Although the PL has minimal practical value in the human upper limb, it plays a critical role in reconstructive hand surgery as a donor tendon for transfer or transplant.[9] The palmaris longus tendon has frequently been utilized as a tendon transplant in a variety of surgical procedures, including chronic tendon damage, chronic lateral ankle instability, and elbow ulnar collateral ligament restoration, among others.[10] In addition, it has been utilized in various combinations to correct oncologic abnormalities of the head and neck, ptosis in children, thumb arthritis with trapezius excision, and Camitz opponensplasty for acute thenar muscle damage.[11]

## METHODS

Cross-sectional research was undertaken in 2023 for a period of one month (15th March to 15th April) to assess the lack of palmaris longus muscle in the students studying at FMH College of Medicine and Dentistry. This study was approved by the FMH College of Medicine and Dentistry's IRB (Institutional Review Board). This study included 447 randomly selected students from various classes of MBBS, first year BDS, and second year DPT (doctor of physical therapy). These candidates were asked to provide a history of any upper-limb accidents or diseases. Before performing the particular tests to determine the presence of Palmaris longus muscle (PL), each individual's upper limb was checked for scars, congenital anomalies, or injuries.

The selected group included 133 males and 314 females. The subject's age ranged was from 19 to 25 years. The students involved in the research endeavor were told about the foundation of the study, and their questions were answered to ease any concerns. These kids were asked to undergo a variety of activity tests to determine the absence of the palmaris longus muscle in both upper forearms. The assistant researchers who opted to join the research team were taught to do the tests. The data gathering period was one month. Previously, several studies performed at least three tests, while the bulk of research employed four tests to confirm PLM agenesis.[12] The tests utilized in this investigating study.

In the standard test (Schaeffer's test), the individual is requested to resist the thumb and little finger before flexing the wrist.[13] Thompson's test requires the subject to create a fist, then flex the wrist, and then oppose and flex the thumb over the fingers.[14]

In the Mishra I test; the examiner passively hyperextends the metacarpophalangeal joints of all fingers while instructing the subject to actively flex the wrist.

The Mishra II test requires the individual to abduct the thumb against resistance while keeping the wrist in modest palmar flexion.[15]

## RESULTS

A total of 447 students were admitted to the study. Of them, 314 were female and 137 were male pupils. The reason for the higher proportion of female students is that more female candidates are admitted to medical institutions than male candidates, hence the majority of students in each class are females, ranging from 60% to 65%. The age range of the participants was 18 to 23 years. The participants were Punjabis from various segments/cities of Punjab province.

Palmaris Longus (PL) was absent in 9 candidates, accounting for 2% of the total 447 students. Four (0.89%) were men, and five (1.11%) were women (Table 1). When compared to the male population of 133 (100%), males constituted 3% and girls comprised 1.5% of a total of 314 students (100%). Individual right and left arm agenesis were also seen. Male students had three right arm absences and one left arm absence out of a total of four. In contrast, among female candidates, right arm agenesis was observed in all five individuals, whereas left arm agenesis was observed in none (Table 1a). Bilateral PL agenesis was not seen in either male or female candidates (Table 1b). Looking at the data, the total lack of PL muscle in the tested group was 9, or 2% out of 447 (100%).

In the Schaeffer's test, agenesis was seen in 4 (44.4%) males and 5 (55.6%) females out of a total of 9 (100%) (Table 2). In the Thompson test, 1(25.0%) male student were absent out of a total of 4 instances (100%), while 2(40%) female students were absent out of a total of 5(100%) (Table 3). In Mishra's test, male agenesis was observed in 1 (25%) of 4 (100%) instances, whereas female agenesis was observed in 2 (40%) of 5 (100%) cases (Table 4). It was discovered that among these clinical tests, agenesis of PL muscle in female instances had the highest sensitivity level. The Fisher exact statistical analysis was a significant predictor between genders, with a very significant p-value <0.0001 for the Thompson test in female instances and a p-value of 0.001 for Mishra's test in females compared to male cases (Table 3, 4).

The Kappa value was used to compare the amount of agreement between the standard Schaeffer's test and the Thompson and Mishra test. According to this statistical study, the Thomson test had a higher moderate degree of agreement with Schaeffer's test (0.495), whereas the Mishra test showed moderate agreement with Schaeffer's test with a score of (0.420) (Table 5).

## DISCUSSION

The diversity of PL muscle has been investigated by researchers in diverse populations throughout the world.[16,17] Its presence or absence has little effect on the movements made by the superficial muscles of the anterior compartment of the forearm, particularly hand motions.[18] Nonetheless, it has been employed as a transplant tissue in a variety of surgical operations, making it an important muscle to note.[19,20] Agenesis of palmaris longus in humans appears to be genetic, although further research is needed to confirm this.[21]

The total incidence of PL muscle absence in this research, regardless of gender, was 2.01%, which is lower than a study done in another city in Punjab, where the overall agenesis was 6%.[22] Similar investigations conducted in Punjabi populations in two additional cities in Pakistan revealed an overall absence of 12.6% and 23.3%.[23,24] Research conducted in India on medical students from the Punjabi community revealed a lower frequency of 11.3%.[25] However, a study in another Indian group in Andhra found a greater frequency of agenesis at 28%.[26] A multicultural survey of medical students at a Malaysian institution found that Indian students had the greatest rate of absenteeism from PL compared to other races.[27] Comparable research of medical and health-related students at Edo State University in Nigeria found a 5.9% lower incidence of PL agenesis.[28]

Table1. Overall prevalence of palmaris longus muscle agenesis according to gender and limbs

| Gender | Right | Left | Totals |
|---|---|---|---|
| Male | 3 (38%) | 1 (100%) | 4 (44%) |
| Female | 5 (63%) | 0 NA | 5 (56%) |
| Totals | 8 (100%) | 1 (100%) | 9 (100%) |

Table 2. Comparison of absence and presence of PL muscle according to gender

| | | | Schaeffer's Test | | Total |
|---|---|---|---|---|---|
| | | | Absent | Present | |
| Gender | Male | Count | 4 | 129 | 133 |
| | | % Schaeffer's Test | 44.4% | 29.5% | 29.8% |
| | Female | Count | 5 | 309 | 314 |
| | | % Schaeffer's Test | 55.6% | 70.5% | 70.2% |
| Total | | Count | 9 | 438 | 447 |
| | | % Schaeffer's Test | 100.0% | 100.0% | 100.0% |

**Table 3. Comparison of Thompson test with Schaeffer's test according to gender**

Gender of the Participant = Male

| | | | Schaeffer's Test | | Total | Pearson Chi-Square | Asymp. Sig. (2-sided) | Fisher's Exact Test | Exacting Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Absent | Present | | | | | | |
| Thompson's Test | Absent | Count | 1 | 0 | 1 | 32.949 | <0.0001 | 0.03 | 0.03 | 0.03 |
| | | % Shaeffer's test | 25.0% | 0.0% | .8% | | | | | |
| | Present | Count | 3 | 129 | 132 | | | | | |
| | | % Shaeffer's test | 75.0% | 100.0% | 99.2% | | | | | |
| Total | | Count | 4 | 129 | 133 | | | | | |
| | | % Shaeffer's test | 100.0% | 100.0% | 100.0% | | | | | |

a. Gender of the Participant = Male

3 Cells (75%) have expected count less than 5. The minimum expected count is. 03.

Gender of the Participant = Female

| | | | Schaeffer's Test | | Total | Pearson Chi-Square | Asymp. Sig. (2-sided) | Fisher's Exact Test | Exacting Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Absent | Present | | | | | | |
| Thompson's Test | Absent | Count | 2 | 0 | 2 | 124.39 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| | | % Shaeffer's test | 40.0% | 0.0% | .6% | | | | | |
| | Present | Count | 3 | 309 | 312 | | | | | |
| | | % Shaeffer's test | 60.0% | 100.0% | 99.4% | | | | | |
| Total | | Count | 5 | 309 | 314 | | | | | |
| | | % Shaeffer's test | 100.0% | 100.0% | 100.0% | | | | | |

In this study, unilateral agenesis was more prevalent in both genders than bilateral agenesis. This is consistent with all of the previous research on the Punjabi population, as well as a study done on the Pakistani Kashmiri community.[29] Male agenesis was more prevalent in the aforementioned investigations done in Multan and Faisalabad, which contradicts the findings of the

current study, which show that female agenesis is somewhat more common than male agenesis. This was also noted in two previous studies conducted in Islamabad and Kashmir. Research that examined papers from 2015 to 2020 looked at the prevalence of PL agenesis in both male and female genders. It was reported that more agenesis was seen in females than males in Iran, the Philippines, Putrajaya in Malaysia, Bathinda in India, Bhairahwa Nepal, Turkey, Sabah in Malaysia, and Egypt, whereas studies in Kathmandu in Nepal, Faisalabad in Pakistan, and Turkey reported higher values in males.[30]

Among the several clinical tests used to detect the absence or presence of PL, the standard Schaeffer's test[31] is the most accurate. This is why it has been utilized in the majority of studies, so that a positive result is regarded dependable by the individual being tested. In this study, the Thompson test agreed better with the Schaeffer's test than the Mishras test in female instances, as observed in a study done on students at MAHSA University Malaysia.[32]

Table 4. Comparison of Mishra test with Schaeffer's test according to gender

Gender of the Participant = Male

| | | | Schaeffer's Test | | Total | Pearson Chi-Square | Asymp. Sig. (2-sided) | Fisher's Exact Test | Exacting Sig (2-sided) | Exact Sig (1-sided) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Absent | Present | | | | | | |
| Mishra's Test | Absent | Count | 1 | 1 | 2 | | | | | |
| | | % Shaeffer's test | 25.0% | .8% | 1.5% | | | | | |
| | Present | Count | 3 | 128 | 131 | | | | | |
| | | % Shaeffer's test | 75.0% | 99.2% | 98.5% | | | | | |
| Total | | Count | 4 | 129 | 133 | 15.372 | <0.0001 | 0.059 | 0.059 | 0.059 |
| | | % Shaeffer's test | 100.0% | 100.0% | 100.0% | | | | | |

a. Gender of the Participant = Male

3 Cells (75%) have expected count less than 5. The minimum expected count is. 06. The standardized statistic is 3.906.

Gender of the Participant = Female

| | | | Schaeffer's Test | | Total | Pearson Chi-Square | Asymp. Sig. (2-sided) | Fisher's Exact Test | Exacting Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Absent | Present | | | | | | |
| Mishra's Test | Absent | Count | 2 | 1 | 3 | | | | | |
| | | % Shaeffer's test | 40.0% | .3% | 1.0% | | | | | |
| | Present | Count | 3 | 308 | 311 | | | | | |
| | | % Shaeffer's test | 60.0% | 99.7% | 99.0% | | | | | |
| Total | | Count | 5 | 309 | 314 | 81.85 | <0.0001 | 0.001 | 0.001 | 0.001 |
| | | % Shaeffer's test | 100.0% | 100.0% | 100.0% | | | | | |

Table5. Cohen's kappa test to assess the percentage of agreement between Schaffer's and other tests for the presence and absence of PLM tendon.

| Test in agreement with Schaffer's test | Cohen's Kappa | 95% CI for Kappa | |
|---|---|---|---|
| | | Lower limit | Upper limit |
| Thompson's | 0.495 | 0.094 | 0.896 |
| Mishra's test 1 | 0.420 | 0.022 | 0.818 |
| Mishra's test 2 | 0.420 | 0.022 | 0.818 |

## CONCLUSION

The absence of Palmaris longus muscle has no effect on the daily hand grip function of an individual but at the same time it has a very important role in reconstruction surgery. However, the congenital basis of its absence is still an area which needs further research.

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## AUTHOR'S CONTRIBUTIONS

**GPW:** Concept, manuscript writing, statistical analysis, data collection, editing
**AS, MS:** Data collection
**SM:** Review of Data
**UB:** Literature research
**TS:** Statistical analysis