

## Prevalence of Absence of the Palmaris Longus Muscle among Medical Students of An-Najah National University: A Cross-Sectional Study from Palestine<sup>†</sup>

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### Abstract

The Palmaris Longus (PL) is a slender; spindle shaped elongated muscle which is visible as a small tendon between other superficial muscles of the forearm, i.e., pronator teres, flexor carpi radialis and the flexor carpi ulnaris. The PL muscle is a highly variable muscle. However, the most common variation is its absence, which is more commonly seen on the left side. There is a wide scope of variation in the prevalence of absence of this muscle in different racial groups, which varies from 3.1% in some populations up to 63.9% in others. This study aims at finding out the prevalence of absence of the PL muscle among Palestinian population. To determine the prevalence of the absence of PL, a cross-sectional design utilizing the Schaeffer's test in a sample of 300 medical students at An-Najah National University with ages ranging between 18-22 years old was used. The overall prevalence of absence of PL muscle in our sample subjects was found to be 32%. Prevalence of bilateral absence was found to be 15.7 %, while the prevalence of unilateral absence of PL was found to be 16.3%. Unilateral absence of the PL muscle on the left side was 8.7 %, which was found to be a little more than that of the right side 7.7% among our 300 subjects. A significant gender-related difference in the overall prevalence of absence of PL on one or both sides, as well as in the prevalence of bilateral absence of muscle and in the prevalence of left-sided absence of muscle where all three indicators were more common in females. We recommend that our findings as well as the findings of other clinical studies be corroborated by conducting dissection studies. This is especially important in the absence of any accurate measurement of the specificity and sensitivity of these tests, while at the same time producing such a wide range of variation in their results in different populations.

**Keywords:** Palmaris Longus; Palestine; prevalence; absence of PL.

### INTRODUCTION

The PL is a highly variable slender, spindle shaped elongated muscle which is visible as a small tendon between other superficial muscles of the forearm, i.e., pronator teres, flexor carpi radialis and the flexor carpi ulnaris [1–4]. It takes origin from the medial epicondyle of the humerus and inserts superficial to the flexor retinaculum at the apex of the palmar aponeurosis. Frequently, it sends a tendinous slip to the short muscles of the thumb.

It is a weak flexor of the wrist and forearm and helps tighten the palmar aponeurosis which serves grip function. However, its function as a flexor muscle is not very significant, hence it is often used surgically as a graft in case of tendon grafting, which makes its presence or absence an important piece of information for hand surgeons. It is innervated by the median nerve C7, C8.

Variation: The PL muscle is a highly variable muscle. There are variations related to its form, where it may be tendinous above

and muscular below [1,2]; or it may be muscular in the center with a tendon above and below; or it may present as two muscular bundles with a central tendon. However, the most common variation is its absence, which is more common on the left side[3] There is a wide scope of variation in the prevalence of absence of this muscle in different racial groups, which varies from 3.1% in some populations [5] up to 63.9% in others [6]. This is especially relevant in the light of the scarcity of similar data in Arab populations where only a few such studies have been done in Egyptian [7], Bahraini [8], and Saudi populations [9,10].

This study aims at finding out the prevalence of absence of the PL muscle in Palestinian population. It is important for us to determine this information in the light of the lack of any similar study in Palestinian population so far. It will be interesting to make a comparison between our findings and the findings of similar studies in other Arab populations and other populations worldwide.

## METHODS

To determine the prevalence of the absence of PL, a sample of 300 medical students of An-Najah National University with ages ranging from 18-22 years old. The following formula is used for calculating the adequate sample size:

$$n = Z^2 P(1-P)/d^2$$

Where n is the sample size, Z is the statistic corresponding to the level of confidence, P is the expected prevalence (that can be obtained from the same study or a pilot study conducted by the researchers), and d is the precision (corresponding to the effect size).

**Table (1):** Frequencies of absence of PLM in males and females in our study sample.

	Males (n=150)	Females (n=150)	P Value is significant when less than 0.05	Complete sample subjects N=300
Absence of PL on one or both sides	N=36 24%	N=60 40%	0.003	N=96 32%
Absence of PL on both sides	N=16 10.7%	N=31 20.7%	0.017	N=47 15.7%

The sample consisted of 150 male and 150 female students who were randomly chosen from An-Najah Medical College students. To identify the absence of the PL muscle, the investigators used the Schaeffer's test, which is done by opposing the thumb to the little finger while flexing the wrist at the same time (Figure 1). Results were considered significant when P-value was less than 0.05.



**Figure (1):** Schaeffer's test (picture taken by the author).

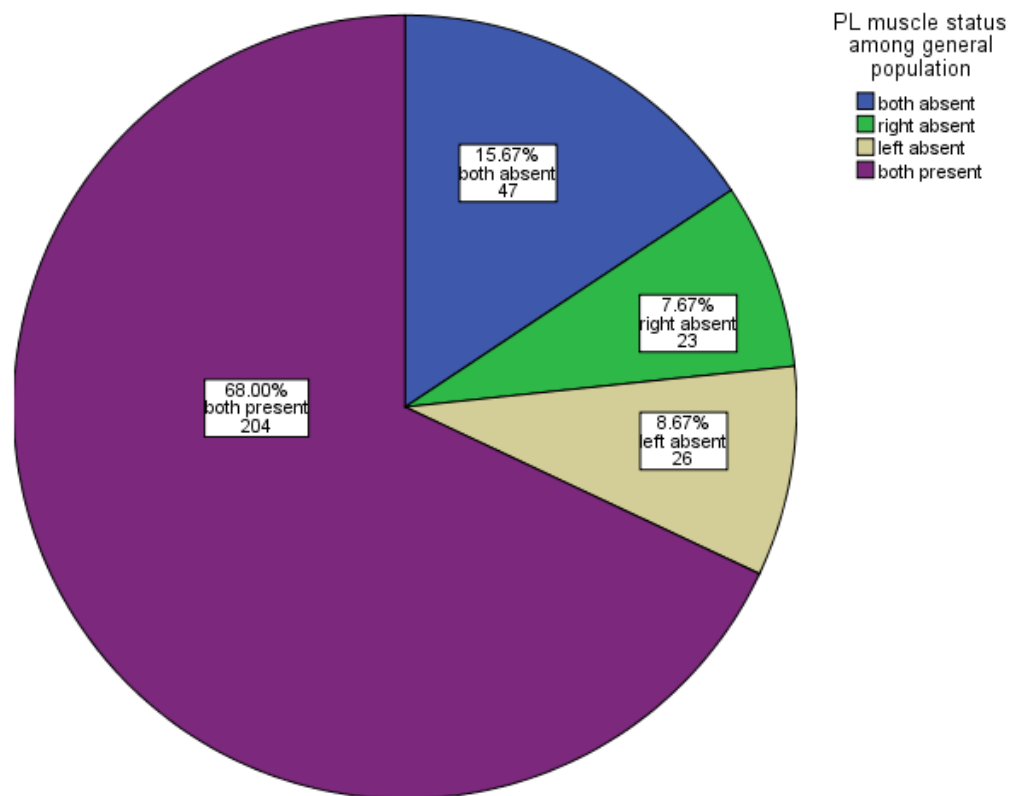
## RESULTS

Our sample consisted of 300 randomly chosen medical students of An-Najah National University aged between 19-22 years old. The research team examined 150 male students and 150 female students for the presence or absence of the Palmaris Longus muscle in both hands right and left. Table 1 summarizes our findings.

	Males (n=150)	Females (n=150)	P Value is significant when less than 0.05	Complete sample subjects N=300
Absence of PL on one side only	N=20 13.3%	N=29 19.3%	P >0.05	N=49 16.3%
Absence of PL on the right side only	N=12 8%	N=11 7.3%	P >0.05	N=23 7.7%
Absence of PL on the left side only	N=8 5.3%	N=18 12%	0.04	N=26 8.7%

The prevalence of absence of PL muscle (both bilateral and unilateral) in our sample of 300 people was found to be 32%. However, the prevalence of bilateral absence was almost equal to the unilateral absence of the muscle, 15.7 vs. 16.3, respectively.

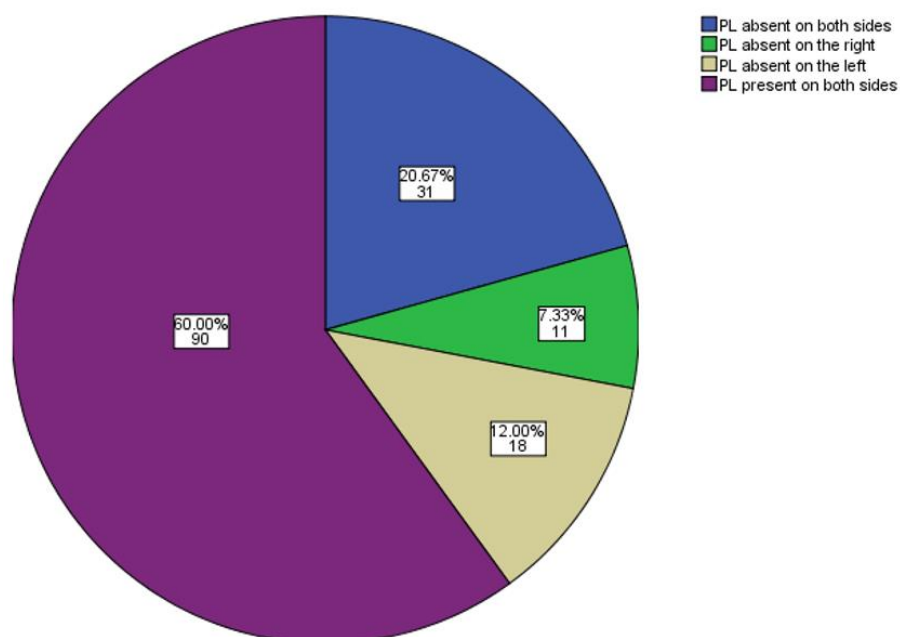
Among our sample subjects who had unilateral absence of muscle, the right side was largely affected as frequently as the left side, 7.7 vs. 8.7, respectively (Figure 2).



**Figure (2):** Distribution of PLM status among the total sample population (male and female).

When we looked at the results in the female subjects examined (Figure 3), we found three main significant differences compared to males where the P value was less than 0.05. These differences are in the overall prevalence of absence of muscle both unilaterally and bilaterally, where in females this was 40% while in males it was only 24%. The other significant difference was in

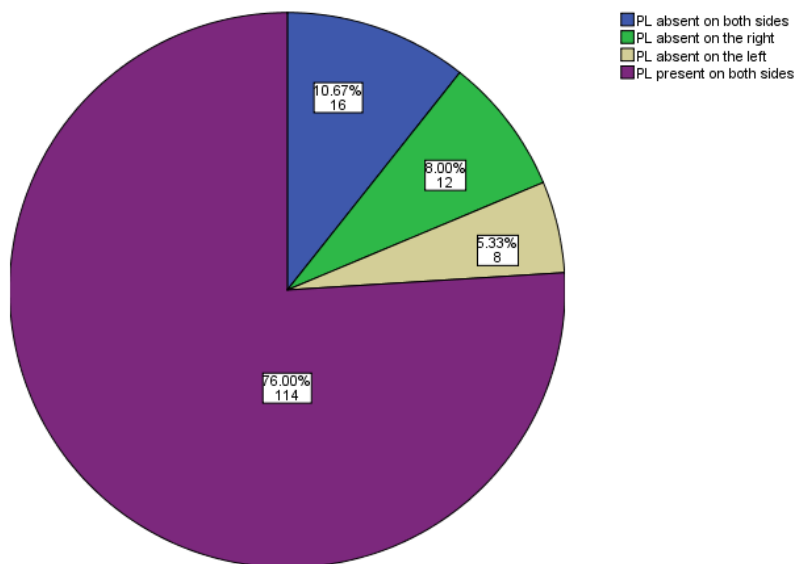
the greater prevalence of absence of muscle on the left side of unilaterally affected females compared to their male counterparts where the prevalence was found to be 12% in females while only 5.3 % in their male counterparts (Table1).



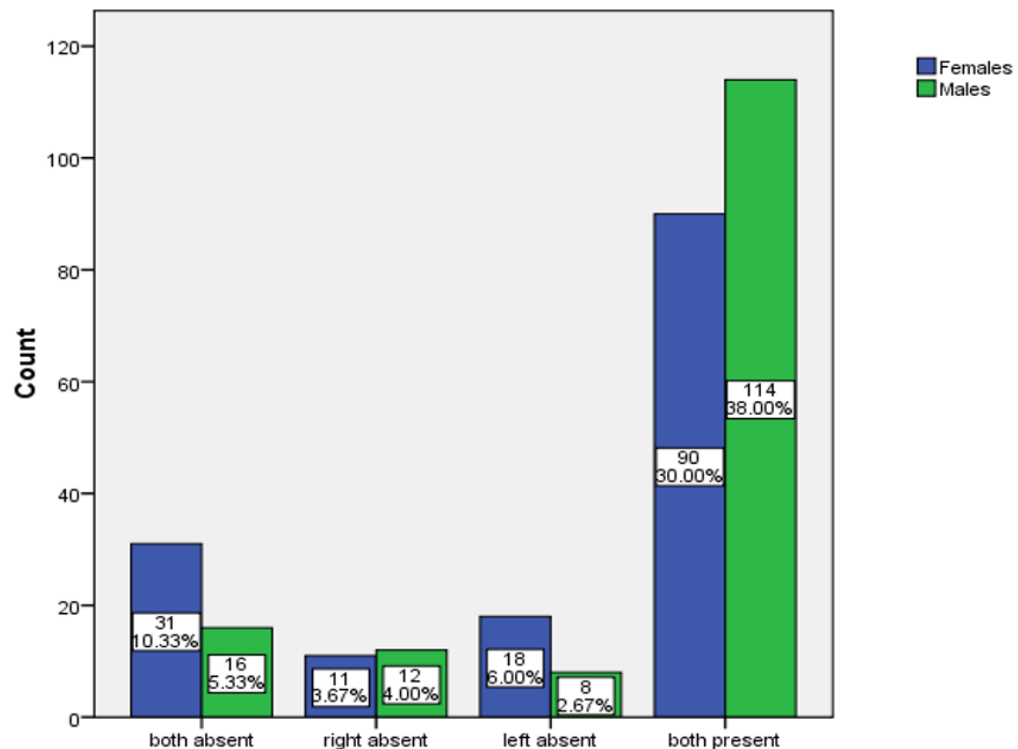
**Figure (3):** Distribution of PLM status among Females.

The third statistically significant difference was the prevalence of bilateral absence of muscle among females compared to males, which was 20.7% and 10.7%,

respectively (Figure 4). Figure 5 compares the findings in males and females



**Figure (4):** Distribution of PLM status among males.



**Figure (5):** Comparison of prevalence of absence of PL muscle between males and females of our subjects.

## DISCUSSION

The overall prevalence of absence of PL muscle in our sample subjects of 32% is a significant finding to keep in mind for orthopedic and hand surgeons concerned about tendon transplant and tendon grafting. This finding is well above the mean of the percentages of absence of PL in many nations and races as seen in Table 2.

The prevalence of absence of PL in the sample was not much different from that found in some other Arab studies such as Bahrainis 36.8 [8], and Saudis 24.5 [9]. However, an Egyptian study found out a remarkably higher prevalence of this event which was around 50.8% [7]. One study found that the pooled ratio of prevalence in Middle Eastern population was 41.7 % while in Turkey it was found to be 34.13 [11]. Worldwide, the prevalence of absence of PLM varies from as low as 1.5% to as high as 63.9% [5], but most of the values are less than 30% as shown in Table 2. It can be safely said that the prevalence of absence of PLM among Palestinian population is among the highest rates in the world although it is far from being the highest.

**Table (2):** Variation in the prevalence of absence of PL between several countries.

No.	Country	Percent of absence of PL
1.	American Africans	4.5
2.	American Asians	2.9
3.	Bahrain	36.8
4.	Brazil	26.5
5.	China	4.6
6.	East Africa	4.4
7.	Egypt	50.80%
8.	Ghana	3.80%
9.	India	27%
10.	Lagos	12.60%
11.	Malaysia	11.30%
12.	Serbia	37.50%
13.	South Korea	4.10%
14.	Turkey	64%
15.	Zimbabwe	1.50%

Bilateral absence in our study was found to be 15.7 % which was not very far from the case in Bahraini population which was 19 % [8] but remarkably higher than that of Saudi population which was 7.75 % in one study[9] and 6.7 % in another [12].

The prevalence of unilateral absence of PL on the left side 8.7% was found to be a little more than that of the right side 7.7% among our 300 subjects. Some other studies found that the left side was more often affected than the right side [6,8,9,13–18]; while other studies found that right-sided absence of PL was commoner than left-sided one [12,19,20], while still others found that their prevalence was equal [21,22].

This study found a significant gender-related difference in the overall prevalence of absence of PL on one or both sides, as well as in the prevalence of bilateral absence of muscle and in the prevalence of left-sided absence of muscle where all three indicators were more common in females. There are several studies which found gender-related differences in the overall prevalence of the absence of PL [7,8,10,15–17,19,21,23]. Most of these found that the prevalence of absence of PL was more common in females, although in many instances this was not statistically significant, but having been reported in many different studies gives it an extra credit in my opinion. However, very few studies reported that it was more common in males [5,19]. On the other hand, some studies found no such differences [13,14,24]. However, the results of this study conform to the current knowledge that PL muscle absence is more common in women and on the left side [5]. Our result of the overall prevalence in females which equals 40% is almost identical to the result of a Saudi study done on females exclusively which was 40.5% [25].

It might be considered a limitation of our study that we used only the Schaeffer's test as an identification tool for the presence or absence of PL muscle which includes opposition of the thumb while at the same time flexing the wrist. Almost all other studies using clinical methods (rather than dissection) started the investigation by using this clinical test and then verified their positive results by using other clinical tests in conjunction with this method, such as Mishra's test I and II, Pushpakumar test, and Thompson test [7,8,19]. A much smaller number of other studies did use this method alone as we did [10,13,20].

## CONCLUSIONS

In conclusion, it seems from the results of this study that the overall prevalence of the absence of PL muscle in our samples falls within the range of prevalences found in other populations of the Middle East region. Our study has also confirmed the presence of significant gender differences in the prevalence of both bilateral and unilateral absence of PL muscle. We recommend that our findings as well as the findings of other clinical studies be corroborated by conducting dissection studies. This is especially important in the absence of any accurate measurement of the specificity and sensitivity of these tests, while at the same producing such a wide range of variation in their results in different groups of populations.

Authors declare that none of them has a conflict of interest regarding this research article.

## REFERENCES

- 1) Murabit A, Gnarra M, Mohamed A. Reversed palmaris longus muscle: Anatomical variant - case report and literature review. *Can J Plast Surg* 2013; 21: 55–6.
- 2) Pai MM, Prabhu L V, Nayak SR, Madhyastha S, Vadgaonkar R, Krishnamurthy A, et al. The palmaris longus muscle: its anatomic variations and functional morphology. *Rom J Morphol Embryol* 2008; 49: 215–7.
- 3) Gabriel SO, Blessing D, Ugboma A. Number 2 Citation S Oladipo Gabriel, C Didia Blessing, A Ugboma. Frequency Of Agenesis Of The Palmaris Longus Muscle In Nigerians. vol. 3. 2008.
- 4) Olewnik Ł, Wysiadecki G, Polguj M, Podgórski M, Jezierski H, Topol M. Anatomical variations of the palmaris longus muscle including its relation to the median nerve - A proposal for a new classification. *BMC Musculoskelet Disord* 2017; 18: 539.
- 5) Ioannis D, Anastasios K, Konstantinos N, Lazaros K, Georgios N. Palmaris Longus Muscle's Prevalence in Different Nations and Interesting Anatomical

- Variations: Review of the Literature. *J Clin Med Res* 2015; 7: 825–30.
- 6) Ceyhan O, Mavt A. Distribution of agenesis of palmaris longus muscle in 12 to 18 years old age groups. *Indian J Med Sci* 1997; 51: 156–60.
  - 7) Raouf HA, Kader GA, Jaradat A, Dharap A, Fadel R, Salem AH. Frequency of palmaris longus absence and its association with other anatomical variations in the egyptian population. *Clin Anat* 2013; 26: 572–7.
  - 8) Sater MS, Dharap AS, Abu-Hijleh MF. The prevalence of absence of the palmaris longus muscle in the Bahraini population. *Clin Anat* 2010; 23: 956–61.
  - 9) Hussain FN, Hasan T. Prevalence of congenital absence of Palmaris Longus tendon in young Jizani population of Saudi Arabia: A cross sectional study. *Pakistan J Med Sci* 2012; 28: 865–9.
  - 10) Hassan FOA, Jabaiti S. Absence of the palmaris longus tendon in mid eastern population. *J Bahrain Med Soc* 2008; 20: 70–3.
  - 11) Yammine K. Clinical prevalence of palmaris longus agenesis: A systematic review and meta-analysis. *Clin Anat* 2013; 26: 709–18.
  - 12) Abdolahzadeh Lahiji F, Ashoori K, Dahmardehei M. Prevalence of palmaris longus agenesis in a hospital in Iran. *Arch Iran Med* 2013; 16: 187–8.
  - 13) Soltani AM, Peric M, Francis CS, Nguyen T-TJ, Chan LS, Ghiassi A, et al. The Variation in the Absence of the Palmaris Longus in a Multiethnic Population of the United States: An Epidemiological Study. *Plast Surg Int* 2012; 2012: 1–4.
  - 14) Nasiri E, Pourghasem M, Moladoust H. The prevalence of absence of the palmaris longus muscle tendon in the north of Iran: A comparative study. *Iran Red Crescent Med J* 2016; 18: 22465.
  - 15) Yong MW, Yusof N, Rampal L, Arumugam M. Prevalence of Absence of Palmaris Longus and Its Association with Gender, Hand Dominance and Absence of FDS Tendon to Little Finger Among Malay Population. *J Hand Surg Asian-Pacific Vol* 2017; 22: 484–9.
  - 16) Morais MA, Gomes, Helrigle C, Malysz T. Prevalence of agenesis of the palmaris longus muscle in Brazil and its clinics correlation. vol. 29. 2012.
  - 17) Sankar KD, Bhanu PS, John SP. Incidence of agenesis of palmaris longus in the Andhra population of India. *Indian J Plast Surg* 2011; 44: 134–8.
  - 18) Tarihi G, Hiz Ö, Ediz L, Fethi Ceylan M, Gezici E, Gülcü E, et al. Prevalence of the absence of palmaris longus muscle assessed by a new examination test (Hiz-Ediz Test) in the population residing in the area of Van, Turkey *J Clin Exp Investig* 2011; 2: 254–9.
  - 19) Nikola Vučinić, Mirela Erić MS. How often absence of palmaris longus and functional deficiency of flexor digitorum superficialis occurs? *Acta Orthop Belg* 2016; 82: 413–9.
  - 20) Thompson NW, Mockford BJ, Cran GW. Absence of the palmaris longus muscle: a population study. *Ulster Med J* 2001; 70: 22–4.
  - 21) Linus Anderson E, LA S, Osinubi A. The Prevalence of Agenesis of Palmaris Longus Muscle amongst Students in Two Lagos-Based Medical Schools. *Int J Morphol* 2010; 28: 849–54.
  - 22) Kose O, Adanir O, Cirpar M, Kurklu M, Komurcu M. The prevalence of absence of the palmaris longus: A study in Turkish population. *Arch Orthop Trauma Surg* 2008; 129: 609–11.
  - 23) Lamichhane PS, Sharma K, Lamichhane N. Study on Palmaris Longus Muscle Tendon Agenesis Among First Year Filipino Medical Students. *J Gandaki Med Coll* 2017; 10: 17–20.
  - 24) Sebastin SJ, Puhaindran ME, Lim AYT, Lim IJ, Bee WH. The Prevalence of Absence of the Palmaris Longus – A Study in a Chinese Population and a Review of the Literature. *J Hand Surg Am* 2005; 30: 525–7.
  - 25) Alabbad A, Alkhamis M, Alsultan M,

