

# MEDICAL SCIENCE

## To Cite:

Almughais ES, Alshammari KAA, Alshammari HH, Alreshidi FF, Alarfaj R, Alshammari RF, Altamimi TN, Aboras R, Almehmadi SA, Balouch FKZ. Assessment of knowledge and practice of Carpal tunnel syndrome among pregnant and non-pregnant women in Hail region, Saudi Arabia. *Medical Science* 2023; 27: e116ms2910. doi: <https://doi.org/10.54905/disssi/v27i132/ee116ms2910>

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## Peer-Review History

Received: 10 February 2023

Reviewed & Revised: 12/February/2023 to 24/February/2023

Accepted: 26 February 2023

Published: 27 February 2023

## Peer-review Method

External peer-review was done through double-blind method.

Medical Science

pISSN 2321-7359; eISSN 2321-7367

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# Assessment of knowledge and practice of Carpal tunnel syndrome among pregnant and non-pregnant women in Hail region, Saudi Arabia

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## ABSTRACT

**Background:** Carpal tunnel syndrome (CTS) is the most common median nerve compression neuropathy. Its symptoms and clinical presentation are well known Carpal tunnel syndrome (CTS) accounts for approximately 90% of peripheral entrapment neuropathy cases. By this study the level of knowledge and attitude towards carpal tunnel syndrome and treatment methods among the population of Hail in Saudi Arabia is assessed. **Methods:** A well-defined questionnaire was conducted among the general population. The study subjects include both male and female gender involving the age above 18 years. The data was collected and questionnaire was used to assess public knowledge and awareness of sciatica symptoms, causes, risk factors, complications and treatment. Duration of study was six month and after collection of data, it was analyzed using the Statistical Package of Social Science Software (SPSS). **Results:** Among 470 people involved in the study, 40.21% aged between 18 and 30 years old, followed by age group (31-40) with 37.87%, then 21.91% aged more than 40 years old. The majority were Saudi (95.96%). **Conclusion:** Patient education is crucial regarding Carpal Tunnel Syndrome. It can have a variety of reasons. Most instances of CTS are treated most effectively with conservative measures unless there is an immediate compression of the nerves. The awareness of community was less than expectation among adult population in Hail city 49% and the symptom worsen (59%) in pregnant ladies.

**Keywords:** Carpal Tunnel Syndrome, Saudi Population, Knowledge, Awareness

## 1. INTRODUCTION

Median nerve fibers can be traced back to cervical roots of C5-C8 and thoracic root and carpal tunnel is a passage where nerves and tendons pass from forearm into the hand and fingers. The median nerve passes through carpal tunnel and lays in a restricted area between the tendons of flexor carpi radialis and flexor digitum superficialis muscles (Wiperman and Goerl, 2016). Carpal tunnel syndrome (CTS) occurs when median nerve is compressed within the tunnel which leads to symptoms like pain, numbness and weakness of thumb opposition and abduction, paresthesia and difficulty holding objects (Wiperman and Goerl, 2016). It affects daily life activities, such as gripping things by hand, brushing teeth, cooking, driving and using a touchscreen (Ajroud et al., 2020).

There are many causes of CTS; most common, rheumatoid arthritis, diabetes mellitus, hypothyroidism, obesity and pregnancy. However, CTS has a strong occupational relationship with jobs that involve hand movement (Ajroud et al., 2020; Khosrawi and Maghrouri, 2012; Yazdanpanah et al., 2012; Alghamdi, 2022). Furthermore, studies on CTS showed that using smartphone for long hours is associated with development of CTS (Wiperman and Goerl, 2016). In addition, it is necessary to consider the duration of using touchscreen as risk factor of CTS (Mohammad, 2019).

So far, patients with metabolic syndrome are more commonly diagnosed with CTS than type1 DM (Alyousef et al., 2019). Pregnancy related carpal tunnel syndrome is one of the frequent neuropathies as a result of fluid retention and edema, which cause heaviness on the median nerve (Rozali et al., 2012). Due to the fact that pregnancy increases the risk of a more severe CTS relapse during the next pregnancy, it is important to diagnose it early on and treat it non-invasively (Ajroud et al., 2020).

Diagnosis can be by physical examination, electro diagnostic studies and plain radiography. Laboratory testing to identify underlying condition: (1) However, studies showed that clinical tests had little specificity and sensitivity as compared with electro diagnosis (Rozali et al., 2012). Management of CTS can be surgical or non-surgical dependent on the severity of symptoms. In some studies, it is reported that conservative treatment usually improves symptoms which include physical therapy, splinting, corticosteroids, therapeutic ultrasound and yoga. Patients with severe symptoms can be treated by surgical decompression which provides a good outcome. However, surgical intervention is rarely indicated in pregnant patients (Aldaghri et al., 2020).

CTS are a common condition that impacts on the quality of life and impaired hand function especially if the patients complain of pain (Sapuan et al., 2012). So far, there are only few published studies about knowledge and practice of Carpal tunnel syndrome, and none of them in Hail region. However, some studies assess the awareness of CTS in Al-Jouf Region and in Al-Majmaah city, Saudi Arabia. A (74.8%) of Al-Jouf participants had a deprived level of consciousness of CTS (Alqunai, 2021), while the awareness of community toward CTS was sufficient among adults in Al-Majmaah city (Alyousef et al., 2019). Therefore, this study was planned to assess the level of knowledge and practice about Carpal tunnel syndrome women and general population in Hail region, Saudi Arabia.

### Review of Literature

Carpal Tunnel Syndrome (CTS) is one of the most commonly reported types of median nerve compression and is a prevalent medical problem. In Kuala Lumpur, Malaysia, a study was designed in 2012 to evaluate the impact of CTS on woman's life in which pregnant women in their 3<sup>rd</sup> trimester that had no additional known risk factors for CTS had CTS clinically diagnosed after being interviewed and examined. It was noted that 24% of pregnant mothers had CTS clinically diagnosed. It also shows that 80.5% of the CTS cases in 3<sup>rd</sup> trimester pregnancy were mild, 17.1% of people had moderate CTS, while just 2.4% experienced severe CTS. Except for those who work in the clinical health setting, such as doctors and nurses, none of the pregnant women were found to be aware of CTS. The study outcomes suggested that CTS in pregnancy should be given more attention and doctors must at least be capable of diagnosing pregnant women with CTS, educate them and recommend conservative measures if necessary (Rozali et al., 2012). In addition, a prospective cross-sectional study was done in Singapore, CTS was randomly diagnosed clinically among pregnant mothers based on patient and physical examination and assessing the severity using Boston carpal tunnel questionnaire (BCTQ). CTS was diagnosed in 24.6% of the pregnant women, nearly most of them were Malays. As for the 3<sup>rd</sup> trimester of pregnancy, Malay women were shown to have a two-fold increased chance of getting CTS compared to patients of other ethnicities. Numbness and tingling were the most common complaint 76.8% especially throughout the day. The outcomes of the study identified the majority of CTS patients thought their symptoms were mild. However, women with moderate-to-severe symptoms and functional impairment were more likely to experience hand pain and symptoms that kept patients awake at night (Sapuan et al., 2020).

Furthermore, a study was done in Libya of an epidemiological study of CTS among pregnant women and it showed that most of the cases are improved by home physiotherapy 79.7% medications improved the cases by 20.3%, 37.8% of cases reported symptomatic relief after massage, 28.4% from rest and 4% from activity. Reducing weight before pregnancy, avoiding repetitive tasks that can aggravate CTS was recommended (Aldaghri et al., 2020).

Subsequently, a study from Iran reported variable prevalence and severity of CTS during pregnancy in Isfahan region and the findings of this study indicate a high prevalence of CTS in pregnant women, an increase in the prevalence and severity of CTS with increasing gestational age and a decrease in asymptomatic cases. However, due to the high prevalence of CTS, it is essential to screen all pregnant women using their clinical signs and to use certain electrodiagnostic testing, particularly in the third trimester of pregnancy (Ajroud et al., 2020). Besides, a study was performed on pregnant women and non-pregnant women to evaluate the prevalence and severity in Yasouj region in Iran and it demonstrated the prevalence of CTS in pregnant women was higher than non-pregnant women. Regarding to the severity of CTS in all women, mild is the most common form. Pregnant women experience severe CTS at a rate of 21.9% compared to 5.6% among non-pregnant women (Yazdanpanah et al., 2012).

## 2. METHODS

### Study design

This was an analytical cross-sectional study to assess the awareness regarding etiologies and risk factor and diagnostic method of sciatica pain. Since the aim of the study was to determine the relationship between to determine their level of awareness and create more advance methods to educate the general population to cope up the difficult situation and take good care of their health.

### Study setting

The study was carried out among Saudi population. Data were collected from general population using questionnaire during the period from 22 August 2022 to 20th January 2023. Sampling and sample; Participants were chosen via probability simple random sampling technique. Participants were selected from the general population. The expected number of sample size was 300 participants. However, the study included 298 participants.

### Inclusion criteria

General population

### Exclusion criteria

Age below 18 years and people living outside the kingdom

### Data analysis

Data was analyzed using SPSS version 25.0. The frequencies, percentage, mean and standard deviation were conducted to describe the distribution of the knowledge. The spearman correlation was used to test the relationship between the knowledge and practice, The Mann Whitney and Kruskal Wallis were used to assess the difference in mean rank score of knowledge and practice in term of socio-demographic factors, a p value than 0.05, 0.01 and 0.001 were considered statistically significant.

### Ethical Consent

Administrative approval will be sought from the unit of biomedical ethics research committee Ethical approval was sought from the ethical committee of the faculty of medicine, (no H-2022-375) university of Hail. An informed consent was taken from the all participants

## 3. RESULTS

There are many causes of CTS; most common, rheumatoid arthritis, diabetes mellitus, hypothyroidism, obesity and pregnancy. However, CTS has a strong occupational relationship with jobs that involve hand movement. This is cross-sectional study include 470 participants. Demographic data is shown in Table 1.

As in Table 1 a total of 470 people involved in the study, 40.21% aged between 18 and 30 years old, followed by age group (31-40) with 37.87%, then 21.91% aged more than 40 years old. The majority were Saudi (95.96%) and got bachelor degree (47.87%), There were six occupations as follows: Teacher (26.60%), student (24.47%), employee (21.91%), housewife (20.21%), nurse (5.11%) and doctor (1.70%).59.36% suffered from obesity, followed by Diabetes Mellitus (22.34%), then Hypothyroidism and other (31.28%) each and Hypertension (10.43%). 40.43% had heard about Carpal Tunnel Syndrome (CTS).

**Table 1** Socio-demographic factors (N=470)

Factor		N	%
Age	18-30	189	40.21
	31-40	178	37.87
	>40	103	21.91
Nationality	Saudi	451	95.96
	Non-Saudi	19	4.04
Education	High school	118	25.11
	Diploma	24	5.11
	Bachelor's degree	225	47.87
	Higher education	78	16.60
	Other	25	5.32
Occupation	Housewife	95	20.21
	Employee	103	21.91
	Teacher	125	26.60
	Student	115	24.47
	Doctor	8	1.70
	Nurse	24	5.11
Chronic disease	Obesity	279	59.36
	Diabetes Mellitus	105	22.34
	Hypertension	49	10.43
	Hypothyroidism	147	31.28
	Other	147	31.28
Have you heard about Carpal Tunnel Syndrome (CTS)?	Yes	190	40.43
	No	280	59.57

Knowledge and Practice towards Carpal Tunnel Syndrome (CTS) were presented. The level of about knowledge and Practice was measured by 4 items each, which were answered by "Yes", "No" and the statements were dichotomized/classified into "Correct" and "Wrong", which is signed by © in the table, so the possible score ranged between zero (the less relevant to knowledge/practice) and 4 (the most relevant to knowledge/practice). In Table 2 the descriptive information of Knowledge and practice towards Carpal Tunnel Syndrome (CTS) is described.

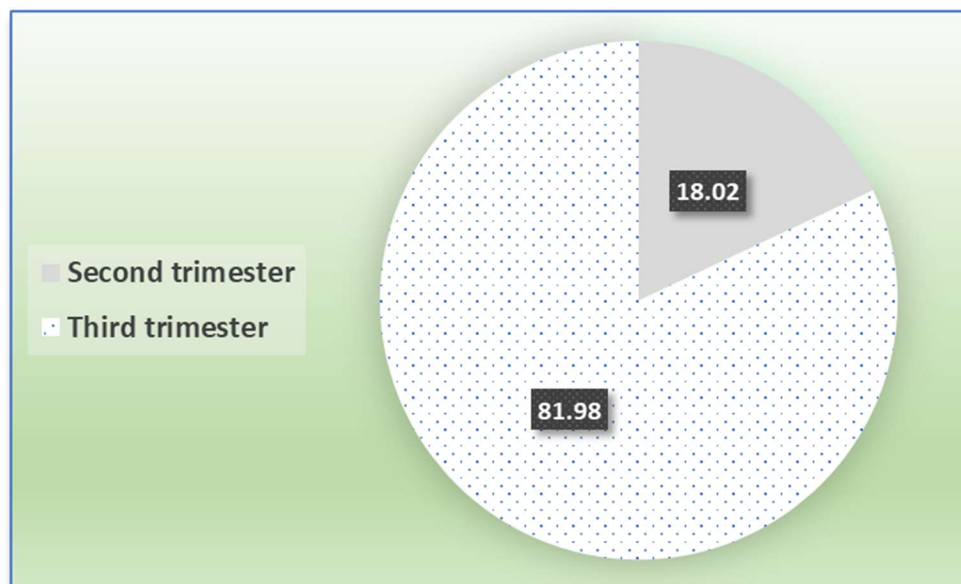
**Table 2** The descriptive information of knowledge and practice towards Carpal Tunnel Syndrome (CTS) (N=190)

Variable	Statement		N	%	
Knowledge towards Carpal Tunnel Syndrome (CTS)	Common symptoms of Carpal Tunnel Syndrome (CTS) are (Pain, tingling of index finger, middle finger and thumb numbness)?	Yes©	190	100.0	
		No	0	0.00	
	Do people with Carpal Tunnel Syndrome (CTS) feel uncomfortable at night?	Yes©	173	91.05	
		No	17	8.95	
	Carpal Tunnel Syndrome (CTS) can affect both hands?	Yes©	142	74.74	
		No	48	25.26	
	Does the pain get worse with daily activities like (using computer, tapping, cooking)?	Yes©	186	97.89	
		No	4	2.11	
	Mean±SD/Level (3.63±0.66/High)				
	Practice towards Carpal Tunnel Syndrome (CTS)	Have you been diagnosed with Carpal Tunnel Syndrome (CTS) by a doctor before?	Yes	168	88.42
No			22	11.58	
Do you think Carpal Tunnel Syndrome (CTS) can be cured by medications (analgesics)?		Yes©	182	95.79	
		No	8	4.21	
Can local corticosteroid injections be used in the management of	Yes©	96	50.53		

	Carpal Tunnel Syndrome (CTS)?	No	94	49.47
	Have you learned the appropriate exercise to prevent Carpal Tunnel Syndrome (CTS)?	Yes <sup>©</sup>	41	21.58
		No	149	78.42
	Do you believe surgery is a definitive treatment for Carpal Tunnel Syndrome (CTS)?	Yes <sup>©</sup>	74	38.95
		No	116	61.05
Practice towards Carpal Tunnel Syndrome (CTS) with pregnancy	Were you pregnant when you were diagnosed with Carpal Tunnel Syndrome (CTS)?	Yes	111	58.42
		No	79	41.58
	Do the symptoms worsen during pregnancy?	Yes <sup>©</sup>	111	58.42
		No	79	41.58
	In which trimester you have noticed the symptoms?	First trimester	0	0.00
		Second trimester	20	18.02
Third trimester		91	81.98	
Mean±SD/Level (2.44±0.85/Moderate)				
© correct answer				
Key: Low knowledge=0.00-1.33; Moderate knowledge=1.34-2.67; High knowledge=2.77-4.00				
Key: Low practice=0.00-1.33; Moderate practice =1.34-2.67; High practice =2.77-4.00				

The mean score and level of knowledge towards Carpal Tunnel Syndrome (CTS) was (3.63±0.66/High). In details; 100.0% agreed that Common symptoms of Carpal Tunnel Syndrome (CTS) are (Pain, tingling of index finger, middle finger and thumb numbness), and 91.05% reported that people with Carpal Tunnel Syndrome (CTS) feel uncomfortable at night and 74.74% agreed that Carpal Tunnel Syndrome (CTS) can affect both hands, 97.89% reported that pain get worse with daily activities like (using computer, tapping, cooking).

The mean score and level of practice towards Carpal Tunnel Syndrome (CTS) was (2.44±0.85/Moderate). In details; 88.42% had been diagnosed with Carpal Tunnel Syndrome (CTS) by a doctor before. 95.79% agreed that Carpal Tunnel Syndrome (CTS) can be cured by medications (analgesics), 50.53% agreed that local corticosteroid injections be used in the management of Carpal Tunnel Syndrome (CTS) and however, only 21.58% had learned the appropriate exercise to prevent Carpal Tunnel Syndrome (CTS) and only 38.95% believed that surgery is a definitive treatment for Carpal Tunnel Syndrome (CTS). 58.42% were pregnant when were diagnosed with Carpal Tunnel Syndrome (CTS). 58.42% agreed that the symptoms worsen during pregnancy. 81.98% noticed the symptoms in the third trimester, followed by second trimester (18.02%), however, no second trimester was reported (Figure 1).



**Figure 1** The distribution of symptoms over the trimesters

### The normality tests

One-Sample Kolmogorov-Smirnov test was conducted to test the normality of the data distribution; the variables (knowledge and practice) were not normally distributed ( $p < 0.05$ ), also the distribution of the demographic factors was inequivalent, thus the non-parametric tests (Spearman correlation, Mann Whitney and Kruskal Wallis) were applied.

### The correlation between the knowledge and practice

The Spearman correlation test was conducted to test the knowledge and practice towards Carpal Tunnel Syndrome (CTS), there were significantly positive association between them ( $r = 0.29$ ,  $p < 0.01$ ). It means that people who were knowledge able to practice.

### The differences of the knowledge and practice scores in term socio-demographic factors

As in Table 3 the Mann Whitney and Kruskal Wallis were applied to present the differences of the variables (knowledge and practice) in term of socio-demographic factors. There were significant differences of the practice in term of their socio-demographic factors ( $p > 0.001$ ) except nationality and chronic disease ( $p > 0.05$ ), knowledge did not differ in term of socio-demographic factors ( $p > 0.05$ ). The practice in term of age differed ( $X^2 = 15.69$ ,  $p < 0.001$ ) with advantage for 31-40 age group and the practice in term of the education differed ( $X^2 = 37.24$ ,  $p < 0.001$ ) with advantage for higher education followed by diploma, the high school had the lowest knowledge, also the practice in term of the occupation differed ( $X^2 = 63.74$ ,  $p < 0.001$ ) with advantage for teacher, the student had the lowest practice.

**Table 3** The differences of the knowledge and practice scores in term of socio-demographic factors (N=190)

Factor	N	Knowledge		Practice		
		Mean rank	Test/p	Mean rank	Test/p	
Age	18-30	51	87.68	4.46/0.11	80.68	15.69***/<0.001
	31-40	94	102.06		92.06	
	>40	45	90.67		90.67	
Nationality	Saudi	18	94.80	332.5/0.17	94.75	323.5/0.22
	Non-Saudi	5	121.50		123.30	
Education	High school	20	84.00	5.48/0.24	68.50	37.24***/<0.001
	Diploma	7	96.50		121.43	
	Bachelor's degree	99	99.33		82.22	
	Higher education	52	97.56		124.04	
	Other	12	73.58		111.25	
Occupation	Housewife	27	78.91	8.37/0.14	96.30	63.74***/<0.001
	Employee	35	90.21		83.43	
	Teacher	79	99.51		122.97	
	Student	19	97.16		40.00	
	Doctor	8	121.50		75.63	
	Nurse	22	99.00		70.23	
Chronic disease	Obesity	43	93.64	2887.5/0.27	95.32	3133.5/0.93
	Diabetes Mellitus	63	87.17	3476/0.06	98.94	3784/0.52
	Hypertension	30	94.42	2367/0.88	100.48	2367.5/0.56
	Hypothyroidism	27	104.09	1968.5/0.26	97.43	2148.5/0.83
	None of the above	27	104.09	1968.5/0.26	97.43	2148.5/0.83

\* $\leq 0.05$ ; \*\* $\leq 0.01$ ; \*\*\* $\leq 0.001$



#### 4. DISCUSSION

CTS are a common condition that impacts on the quality of life and impaired hand function especially if the patients complain of pain (Rozali et al., 2012). So far, there are only few published studies about knowledge and practice of Carpal tunnel syndrome and none of them in Hail region. Therefore, this study was planned to assess the level of knowledge and practice about Carpal tunnel syndrome in this region, Saudi Arabia. There are number of studies discussed the awareness of Carpel Tunnel Syndrome among different types of populations (Sapuan et al., 2012).

In a study done in India that investigated the responsiveness of CTS among the population in Chennai city. It was noted that approximately 72% of the participants have not heard about CTS, 76.5% were unaware of CTS's symptoms. It has been observed that people who work in industries involving computer work, working with devices and having prolonged exposure to electronics are more likely to get CTS (Nazish et al., 2019; Kandhan et al., 2017).

Another cross-sectional study done in Saudi Arabia assessed the awareness level of the study population in Al-Majmaah city. The study outcomes identified that the females are more than males 57.6% to 42.4%. Around one third 30.1% of the patient thought that the clinical features can happen with CTS is "Pain in wrist", 26.8% "Tingling and numbness in thumb, index and middle finger", 8.4% "Weakness affecting the thumb muscle", 11.6% "Decreased overall hand grip", 12.7% "Muscle wasting in the hand", 10.3% "Changing of pain intensity while moving the wrist". Also, according to the study, there is a significant link between chronic disease and CTS. Participants believed that CTS could have an impact on a patient's sleep, job performance and social life in 79.01%, 84.97% and 70.4% of cases, respectively. Also, the awareness of community was appropriate among the adult population in Al-Majmaah city (Alyousef et al., 2019).

In contrast, inadequate level of awareness was reported in a cross-sectional study that was conducted among adult population in Al-Jouf region, Saudi Arabia toward awareness of CTS. In this study a total of 420 participants were enrolled and based on the socio-demographic data, 49.8% of the participants were men and 50.2% were women. In terms of the details of CTS, participants knew that it was brought on by the entrapment of the median nerve 26.2%, 20.2% of the participants were aware that the symptoms started gradually and overnight and that if left untreated they could result in stiffness and weakness, while 29.3% were aware that the common symptoms were discomfort, tingling in the index, middle and thumb fingers. According to the answers of the participants, the awareness level was classified as poor and good and 74.8% of the participants considered having a low level of awareness with insufficient information about CTS. The outcomes conducted correlation between awareness of CTS and age (Alqunai, 2021).

On top of that in a case-control study that assessed the personal factors associated with CTS and it was found that the performance of domestic chores was strongly linked to CTS (Shahrani et al., 2021). At Al-Majmaah University, Saudi Arabia female touchscreen users tended to have a higher incidence of CTS (Mohammad, 2019). According to a study done in Riyadh region, Saudi Arabia demonstrated a link between increased smartphone use time and the onset of CTS (Mohammad, 2019).

As for the patients awaiting Carpal Tunnel Syndrome surgery, a study suggests a combination of instructions, night splinting and at home exercises decreased the need for surgery and improved patients' perceptions of their condition (Al-Shahrani et al., 2021).

In Saudi Arabia a study of the prevalence of hypothyroidism reviewed that female within 46-60 years were most of the participants, 13.8% were suffering from hypothyroidism. The disease lasted for one to five years. And it also showed that CTS is not affected by thyroid abnormalities, but a high BMI is strongly linked to hypothyroidism (Lewis et al., 2020). Interestingly, another study proved that obesity and diabetes mellitus are the most often identified risk factors for CTS (Al-Shahrani and Al-Shehri, 2021).

#### 5. CONCLUSION

The results show that the awareness of community population was sufficient among population and show that the prevalence of CTS is 14% it is nearly equal the international population prevalence. In addition, the study shows there is a strong relationship between CTS and chronic disease. In addition, it is concluded that CTS can affect the quality of life and can disturb daily work.

##### Author contributions

ESA and RF, SH and RA wrote first draft of the manuscript. TEH, TNA, FFA, ZFK and RA collected data and literature. FFA and FK and TEH reviewed the manuscript. FK contributed in literature search and finalized the manuscript. All authors read and approved the final version of the manuscript.

**Acknowledgment**

The authors would like to thank the participants in this study for offering the samples.

**Informed consent**

Written & Oral informed consent was obtained from the participant identified in this study.

**Funding**

This study has not received any external funding.

**Conflict of interest**

The authors declare that there is no conflict of interests.

**Data and materials availability**

All data sets collected during this study are available upon reasonable request from the corresponding author.

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