

PREVALENCE OF NECK AND UPPER EXTREMITY DISABILITY AMONG SONOGRAPHERS OF TWIN CITIES

Original Research

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ABSTRACT

Background: Sonographers are at high risk for developing musculoskeletal disorders due to the repetitive nature of their work and sustained static postures, particularly affecting the neck and upper limbs. These occupational demands can lead to persistent discomfort and functional limitations, ultimately impacting professional performance and quality of life. Despite growing global awareness, the burden of such disabilities in Pakistan remains underreported, especially among diagnostic professionals in the twin cities of Rawalpindi and Islamabad.

Objective: To determine the prevalence of neck disability, upper extremity disability, and work-related upper extremity impairment among sonographers.

Methods: This descriptive cross-sectional study was conducted from February 2022 to June 2022 among 106 sonographers working in diagnostic centers and hospitals across Rawalpindi and Islamabad. Participants were selected through non-probability sampling. Inclusion criteria comprised sonographers aged 24–65 years, with more than one year of experience, and working over 20 hours per week. Data were collected using a semi-structured questionnaire. The Neck Disability Index (NDI) was used to assess neck disability, while the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire and its work module were employed to evaluate upper extremity disability and work-related impairments. Data analysis was performed using SPSS version 26, with results expressed in frequencies and percentages.

Results: Out of 106 recruited participants, 102 completed the survey. Among them, 87.3% (n=89) experienced mild neck disability. Mild upper extremity disability was reported by 40.2% (n=41) of sonographers. Additionally, 67.6% (n=69) of participants presented with mild work-related upper extremity disability according to the DASH work module.

Conclusion: The findings confirm that neck and upper extremity disabilities are highly prevalent among sonographers in Pakistan. Most participants exhibited mild forms of disability, emphasizing the need for ergonomic adjustments, preventive strategies, and awareness to safeguard this essential healthcare workforce.

Keywords: DASH questionnaire, Musculoskeletal pain, Neck Disability Index, Occupational health, Prevalence, Sonographers, Work-related disability.

INTRODUCTION

The neck serves as a critical anatomical bridge between the head and trunk, housing numerous vital structures essential to physiological function (1). It comprises an intricate network of muscles, including the sternocleidomastoid, scalene group, trapezius, and suboccipital muscles—that work synergistically to support movement and maintain posture (2). Neck pain is a widespread musculoskeletal complaint, ranking among the most common globally with an age-standardized prevalence of 27.0 per 1000 population as of 2019 (3). Etiological factors contributing to neck discomfort are diverse, ranging from degenerative spinal conditions such as osteoarthritis and spinal stenosis, to mechanical stressors like poor posture, trauma, malignancy, and repetitive strain (4). Ligamentous structures, including the anterior and posterior longitudinal ligaments and ligamentum flavum, further contribute to the structural integrity of the cervical spine but are also prone to degenerative changes over time (5). One of the most frequent pathological developments associated with aging in the cervical spine is osteoarthritis, which results from the gradual breakdown of cartilage protecting the facet joints, potentially leading to cervical spondylosis and nerve impingement (6). Symptoms of neck pain vary in severity and are often exacerbated by prolonged static positions, such as during computer use or driving (7). Neurological involvement may manifest as muscle weakness, sensory disturbances, and tingling sensations due to inflammation affecting the surrounding soft tissues and neural structures (8). The biopsychosocial model of disability, as outlined by the World Health Organization's International Classification of Functioning, Disability and Health (ICF), provides a comprehensive framework to understand how impairments in body structures and functions interact with environmental and personal factors to influence participation and activity (9).

Within the healthcare sector, diagnostic medical sonographers represent a workforce particularly vulnerable to work-related musculoskeletal disorders (WMSDs), especially in the cervical and upper extremity regions. The occupational demands of sonography, including repetitive hand movements, sustained awkward postures, excessive transducer grip force, and long scanning durations—pose significant biomechanical and psychological stress (10). These ergonomically adverse conditions have been shown to contribute to the high prevalence of WMSDs, which can manifest as persistent neck, shoulder, and arm pain, ultimately impacting job performance and quality of life (11). The complex interaction between mechanical loading, cumulative strain, and insufficient recovery time often exacerbates these disorders, particularly in high-demand clinical settings (11,12). While previous literature has investigated neck and upper limb disabilities among female sonographers, there remains a gap in understanding these outcomes across both genders, particularly with the concurrent application of validated clinical tools such as the Neck Disability Index (NDI) and the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire. Moreover, prior studies have often failed to assess work-related disability holistically, overlooking the impact of task repetition, psychological burden, and occupational ergonomics. Therefore, this study aims to determine the prevalence of neck disability, upper extremity disability, and work-related musculoskeletal impairment among male and female sonographers using both NDI and DASH measures, providing a more comprehensive assessment of occupational health risks in this professional group.

METHODS

This descriptive cross-sectional study was conducted among diagnostic medical sonographers working in the twin cities of Rawalpindi and Islamabad between February 2022 and July 2022. Ethical clearance for the research was granted by the Institutional Review Board (IRB) of the affiliated university under the reference number IRB-/DPT/1022-1305, and all procedures adhered to established ethical standards in human subject research. Participants were recruited using an intuitive non-probability sampling technique from 26 distinct radiology and diagnostic imaging laboratories. All participants were fully informed about the nature and objectives of the study, and written informed consent was obtained before data collection commenced. Eligible participants included sonographers aged between 24 and 65 years, with at least one year of professional experience, and working a minimum of 20 hours per week. Only those who voluntarily agreed to participate were included in the study. Individuals with a prior diagnosed case of cervical spine degenerative changes or malignancy were excluded to eliminate confounding variables that might independently influence musculoskeletal symptoms. The sample size was calculated using Slovin's formula, with a 95% confidence interval and a 5% margin of error, yielding a target of 106 participants. Data collection was carried out through a standardized self-administered questionnaire. This tool comprised sections to reconfirm eligibility based on inclusion and exclusion criteria and incorporated two validated outcome measures: the Neck Disability

Index (NDI) and the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire. These tools were selected for their established reliability and validity in musculoskeletal research and allowed comprehensive assessment of cervical and upper limb functional impairments. Data was analyzed using the Statistical Package for the Social Sciences (SPSS), version 26. Descriptive statistics were employed to summarize the data, with results expressed in terms of frequencies and percentages for categorical variables. All procedures, from participant recruitment to data analysis, were conducted with a focus on maintaining methodological rigor and ethical integrity.

RESULTS

Out of the initially recruited 106 participants, 4 were excluded due to incomplete data, resulting in a final sample of 102 sonographers. The majority of the participants were female (65.7%, $n=67$), and most fell within the 31–35-year age range (64.7%, $n=66$), followed by those aged 36–40 years (20.6%, $n=21$). A smaller portion of the sample comprised individuals aged 24–30 years (11.8%, $n=12$) and 41–45 years (2.9%, $n=3$). Neck disability was commonly reported among participants. Most individuals (65.7%, $n=67$) described experiencing mild pain, while 34.3% ($n=35$) reported no pain at the time of assessment. Regarding personal care, 52.9% ($n=54$) performed daily tasks without extra pain, and 46.1% ($n=47$) experienced additional discomfort while doing so. A notable 57.8% ($n=59$) experienced pain when lifting heavy objects, and 60.8% ($n=62$) reported mild pain during recreational activities. While driving, 69.6% ($n=71$) experienced slight neck pain. Overall, mild neck disability was present in 87.3% ($n=89$) of the participants, with the most frequently reported symptoms including infrequent headaches (61.8%, $n=63$) and slight sleep disturbances (44.1%, $n=45$).

With respect to upper extremity function as assessed by the DASH questionnaire, 61.8% ($n=63$) reported mild difficulty in pushing or opening heavy doors, and 68.6% ($n=70$) experienced mild difficulty placing objects on overhead shelves. Heavy household chores posed mild difficulty for 54.9% ($n=56$), while 50.0% ($n=51$) found carrying objects over 10 pounds mildly challenging. Furthermore, 76.5% ($n=78$) experienced mild difficulty washing their back, and 62.7% ($n=64$) reported stiffness in the arm, shoulder, or hand. Mild difficulty with work-related recreational activities was reported by 61.8% ($n=63$), and 64.7% ($n=66$) experienced mild pain in the upper extremities. In the context of work-related disability, 82.4% ($n=84$) reported mild difficulty using their usual techniques at work. A similar proportion (74.5%, $n=76$) had mild difficulty continuing their regular tasks due to arm, shoulder, or hand pain. Additionally, 65.7% ($n=67$) reported being mildly limited in the time they could spend performing work-related duties, while 68.6% ($n=70$) could not work to their desired level of performance due to discomfort. Overall, 67.6% ($n=69$) experienced mild work-related upper extremity disability.

Notably, mild neurological symptoms such as tingling (36.3%, $n=37$) and weakness (58.8%, $n=60$) in the arms or hands were also observed. Mild interference in social activities was reported by 57.8% ($n=59$), and 38.2% ($n=39$) strongly agreed that pain disrupted their sleep. Despite these issues, 49.0% ($n=50$) disagreed with the statement that their symptoms made them feel less capable or useful. To further quantify the severity of disability, overall classifications and total scores for the Neck Disability Index (NDI) and Disabilities of the Arm, Shoulder, and Hand (DASH) were computed. The NDI scores revealed that the majority of participants fell within the "mild" disability category, followed by a significant proportion in the "moderate" range. The mean NDI total score across the sample was 18.04 ± 3.97 , consistent with the predominance of mild to moderate functional limitations. Similarly, analysis of the DASH scores showed that most respondents were classified as having "mild" upper extremity disability, while a notable proportion exhibited "moderate" difficulty. The mean DASH total score was 27.86 ± 5.89 , aligning with a trend toward mild to moderate impairment in upper limb function. These quantified scores provide a standardized reflection of the disability burden and support the descriptive findings of prevalent mild functional limitations among sonographers.

Table 1: Demographic characteristics of age

Age	Frequency (n)	Percentage (%)
24-30	12	11.8
31-35	66	64.7
36-40	21	20.6
41-45	3	2.9
Total	102	100.0

Table 2: Neck disability index of the Sonographers

Neck Disability index	Questions	Frequency (n)%
Pain intensity	I have no pain at the moment	(35)34.3%
	The pain is very mild at the moment	(67)65.7%
Personal care	I can look after myself normally without causing extra pain	(54)52.9%
	I can look after myself, but it causes extra pain	(47)46.1%
Lifting	It is painful to look after myself and I am slow and painful	(1)1.0%
	I can lift heavy weight without extra pain	(33)32.4%
	I can lift heavy weight, but it gives me extra pain	(59)57.8%
	Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned	(10)9.8 %
Reading	I can read as much as I want with no neck pain	(56)54.9%
	I can read as much as I want with slight neck pain	(45)44.1%
	I can read as much as I want with moderate neck pain	(1)1.0%
Headache	I have no headache at all	(18)17.6%
	I had slight headache that come infrequently	(63) 61.8%
	I have moderate headache that come infrequently	(21) 20.6%
Concentration	I can concentrate fully when I want with no difficulty	(61)59.8%
	I can concentrate fully when I want to with slight difficulty	(41) 40.2%
	I can do as much work as I want	(40) 39.2%
Work	I can only do my usual work but no more	(55) 53.9%
	I can do most of my usual work but no more	(7)6.9%
Driving	I can drive my car without any neck pain	(29)28.4%
	I can drive my car as long as I want with slight neck pain	(71)69.6%
Sleeping	I can drive my car as long as i want with moderate neck pain	(2) 2.0%
	I have no trouble sleeping	(57)55.9%
	My sleep is slightly disturbed (less than 1 hour sleeplessness)	(45) 44.1%
Recreation	I am able to engage in all my recreation activities with no neck pain	(37)36.3%
	I am able to engage in all my recreation activities with some neck pain	(62) 60.8%
	I am able to engage in most but not all my usual recreation activities because of neck pain	(3) 2.9%

Table 3: Frequency of Work Module

Work Module		(n)%
Using your usual technique for your work	no difficulty	14 (13.7) %
	mild difficulty	84 (82.4) %
	moderate difficulty	4 (3.9) %
Doing your usual work because of arm, shoulder or hand pain	no difficulty	22 (21.6) %
	mild difficulty	76(74.5) %
	moderate difficulty	4 (3.9) %
	no difficulty	29 (28.4) %
Doing your work as well as you would like	mild difficulty	70(68.6) %
	moderate difficulty	3 (2.9) %
Spending your usual amount of time doing your work	no difficulty	29 (28.4) %
	mild difficulty	67 (65.7) %
	moderate difficulty	6 (5.90) %

Table 4: Disability of Arm, shoulder and Hand of participants

Disability of Arm Shoulder and Hand		Frequency (n)	Percentage %
Open a tight or new jar	no difficulty	38	37.3
	mild difficulty	64	62.7
Write	no difficulty	49	48.0
	mild difficulty	53	52.0
Turn a key	no difficulty	60	58.8
	mild difficulty	42	41.2
Prepare a meal	no difficulty	37	36.3
	mild difficulty	65	63.7
Push open a heavy door	no difficulty	20	19.6
	mild difficulty	63	61.8
	moderate difficulty	19	18.6
Place an object on the shelf above your head	no difficulty	28	27.5
	mild difficulty	70	68.6
	moderate difficulty	4	3.9
Do heavy household chores (e.g. wash walls or floor)	mild difficulty	56	54.9
	moderate difficulty	28	27.7

Disability of Arm Shoulder and Hand		Frequency (n)	Percentage %
Garden or do yard work	moderate difficulty	28	27.5
	severe difficulty	1	1.0
Make a bed	no difficulty	71	69.6
	mild difficulty	31	30.4
Carry a shopping bag or briefcase	no difficulty	34	33.3
	mild difficulty	62	60.8
	moderate difficulty	6	5.9
Carry a heavy object (over 10 lbs.)	no difficulty	28	27.5
	mild difficulty	51	50.0
	moderate disability	23	22.5
Change a lightbulb overhead	no difficulty	22	21.6
	mild difficulty	80	78.4
Wash or blow dry your hair	no difficulty	25	24.5
	mild difficulty	75	73.5
	moderate difficulty	2	2.0
Wash your back	no difficulty	22	21.6
	mild difficulty	78	76.5
	moderate difficulty	2	2.0
Put on a pullover sweater	no difficulty	42	41.2
	mild difficulty	60	58.8
Use a knife to cut food	no difficulty	57	55.9
	mild difficulty	45	44.1
Recreation activities which require little effort e.g., card playing, knitting etc.	no difficulty	32	31.4
	mild difficulty	69	67.6
	moderate difficulty	1	1.0
Recreation activities which take some force or impact through arm, shoulder or hand (e.g., golf, hammering, tennis etc.)	no difficulty	17	16.7
	mild difficulty	63	61.8
	moderate difficulty	22	21.6
Recreation activities in which you move your arm freely	no difficulty	18	17.6
	mild difficulty	62	60.8
	moderate difficulty	22	21.6
	no difficulty	46	45.1

Disability of Arm Shoulder and Hand		Frequency (n)	Percentage %
Manage transportation needs (getting from one place to another)	mild difficulty	55	53.9
	moderate difficulty	1	1.0
Sexual activities	no difficulty	62	60.8
	mild difficulty	40	39.2
During the past week to what extent has your arm, shoulder or hand interfered with your normal social activities with family, friends, neighbors or groups	no difficulty	43	42.2
	mild difficulty	59	57.8
During the past week you were limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem	no difficulty	35	34.3
	mild difficulty	67	65.7
Arm, shoulder or hand pain	no difficulty	33	32.4
	mild difficulty	66	64.7
	moderate difficulty	3	2.9
Arm shoulder or hand pain when you perform any specific activity	no difficulty	42	41.2
	mild difficulty	58	56.9
	moderate difficulty	2	2.0
Tingling pins or needles in arm shoulder or hand	no difficulty	63	61.8
	mild difficulty	37	36.3
	moderate difficulty	2	2.0
Weakness in your arm shoulder or hand	no difficulty	32	31.4
	mild difficulty	60	58.8
	moderate difficulty	10	9.8
Stiffness in arms shoulder or hand	no difficulty	19	18.6
	mild difficulty	64	62.7
	moderate difficulty	19	18.6
During the past week how, much difficulty has to had in sleeping because of pain in your arm shoulder or hand	strongly agree	39	38.2
	disagree	63	61.8
	strongly disagreed	40	39.2
I feel less capable less confident or less useful because of my arm, shoulder or hand problem	disagree	50	49.0
	neither agreed nor disagreed	12	11.8

Table 5: DASH Score Classification

DASH Classification	Frequency (n)	Percentage (%)
Mild	12	11.8
Moderate	87	85.3
Severe	3	2.9
Very Severe	0	0

Table 6: NDI Score Classification

NDI Classification	Frequency (n)	Percentage (%)
No Disability	0	0
Mild	17	16.7
Moderate	80	78.4
Severe	5	4.9
Complete	0	0

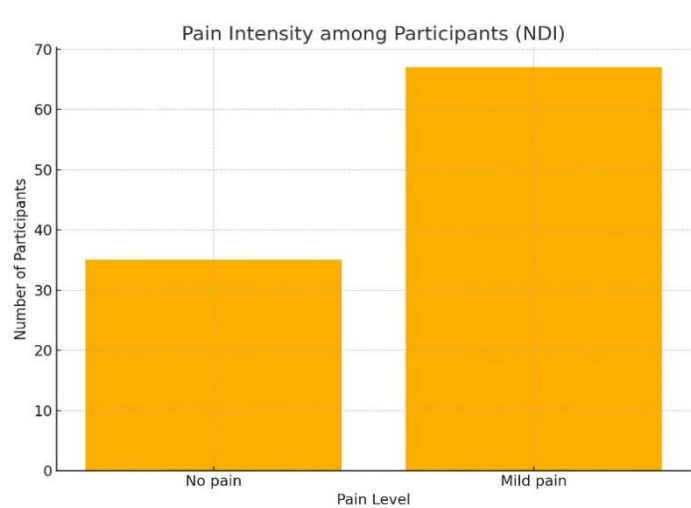


Figure 2 Pain Intensity Among Participants (NDI)

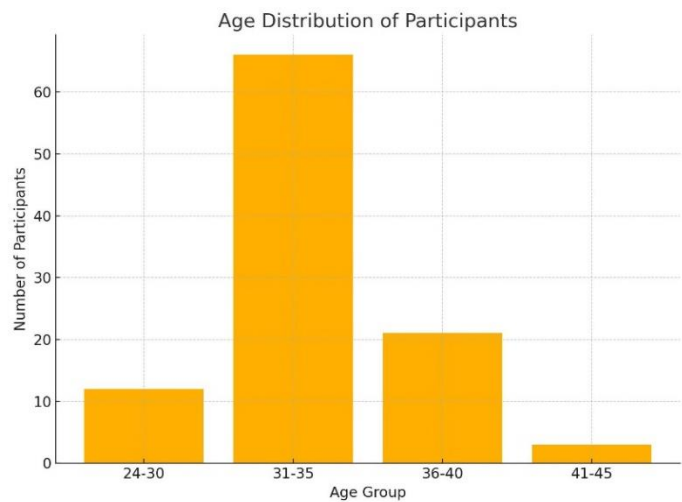
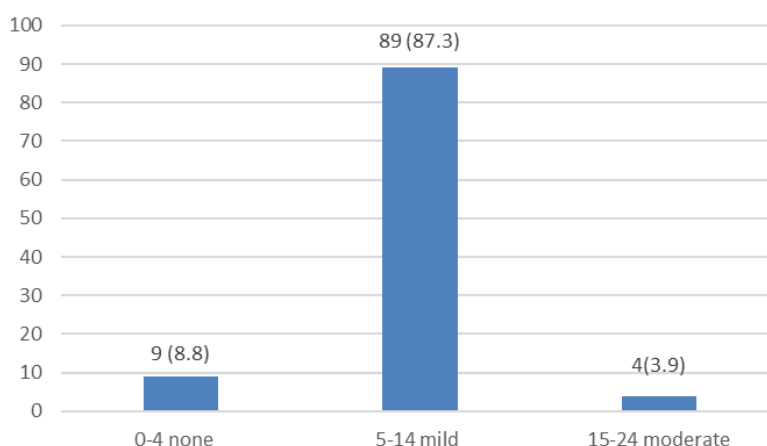


Figure 1 Age Distribution of Participants



DISCUSSION

The findings of this study revealed a high prevalence of mild neck disability among sonographers, with 87.3% of participants exhibiting symptoms consistent with postural strain. This observation aligns with previous research conducted on populations subjected to sustained static postures, such as medical students experiencing text neck syndrome due to prolonged use of digital devices. In those cohorts, the majority also presented with mild neck disability, suggesting a consistent association between extended periods of forward head posture and cervical strain (13,14). The comparable results reinforce the notion that occupational posture and duration of task engagement are critical determinants of musculoskeletal health, regardless of profession. Among sonographers, the consistent need to maintain awkward neck positions during scanning procedures appears to mirror the effects seen in sedentary, screen-based academic activities (15). Supporting this inference, another study conducted on individuals engaging in more than five hours of continuous device use daily also documented a high incidence of neck disability, corroborating the current study's finding that extended duration in constrained postures is a significant risk factor. In both cases, mild disability was the predominant severity level, underscoring that while the impairments may not be functionally debilitating, they are nonetheless persistent and clinically relevant. These results emphasize the need for ergonomic interventions and work-rest cycle optimization in professions involving prolonged static posturing (16,17).

In relation to upper extremity disability, the present study identified that 40.2% of sonographers experienced some degree of arm, shoulder, or hand dysfunction, with most cases falling within the mild category according to DASH criteria. These findings are consistent with previous literature indicating that sonographers, particularly those working with outdated or non-adjustable equipment, experience heightened physical demands and a corresponding increase in musculoskeletal symptoms (18,19). However, while some studies highlighted disparities between rural and urban practice environments, such contextual factors were not addressed in the current study. This omission may limit the generalizability of the findings across various healthcare settings and equipment access levels. Work-related disability, as assessed by the DASH work module, was reported by 67.6% of the participants in this study. These results suggest a substantial occupational burden, with upper extremity discomfort interfering with professional duties. Similar patterns have been observed among surgeons and other procedural professionals, where repetitive tasks and static postures lead to varying degrees of musculoskeletal disorders (20). These findings collectively illustrate that occupational biomechanics have a profound influence on musculoskeletal health across a spectrum of healthcare professions, and that early identification and modification of risk factors are essential in preventing long-term disability.

This study has several strengths, including the use of validated outcome tools (NDI and DASH) and the inclusion of both male and female participants, which enhances its representativeness. However, it is not without limitations. The use of non-probability sampling limits the ability to generalize the results beyond the study population. Additionally, the cross-sectional design restricts causal inference, and the lack of subgroup analysis based on years of experience, type of institution, or ergonomic training status precludes a deeper understanding of contributory variables. Future studies should adopt longitudinal approaches and incorporate ergonomic assessments to evaluate the effect of workplace interventions over time. Incorporating objective measures such as electromyographic data or biomechanical modeling could also enrich future investigations by providing physiological correlates to the subjective findings (21). In summary, the study highlights a concerning prevalence of mild neck and upper extremity disability among sonographers, driven largely

by occupational posture and repetitive tasks. While disability is often mild, its widespread presence necessitates targeted preventive strategies to preserve long-term musculoskeletal health in this essential healthcare workforce.

CONCLUSION

This study concluded that sonographers in Rawalpindi and Islamabad commonly experience mild neck and upper extremity disabilities, both in general function and in work-related activities. These findings, identified through standardized screening tools, underscore the occupational strain associated with prolonged static postures and repetitive movements inherent in sonographic practice. The results highlight the pressing need for ergonomic interventions, preventive strategies, and workplace modifications to reduce musculoskeletal risk and support the long-term well-being and productivity of sonographers within clinical settings.

AUTHOR CONTRIBUTION

Author	Contribution
Marium Khalid*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Rehana Ashfaq	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Sidra Hanif	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Abeera tul Jannat Satti	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Manahil Shahid	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Zoha Furrukh	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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