PREVALENCE OF DIABETIC POLYNEUROPATHY AND FUNCTIONAL LIMITATION DUE TO CARPAL TUNNEL SYNDROME IN TYPE 2 DIABETES AND THEIR ASSOCAITION WITH DEMOGRAPHIC FACTORS IN TWIN CITIES.

Araib Kaleem[1], Rabbia Sajid[2], Hania ul Ain[3], Mahnoor Syed[4], Sadia Arif[5]

[1]Rawalpindi Medical College, Rawalpindi

[2,3,5]Government College University, Faisalabad

[4]Abasyn University, Islamabad

Research topic: prevalence of diabetic polyneuropathy and functional limitation due to carpal tunnel syndrome in type 2 diabetes and their association with demographic factors in twin cities**. Background:** Diabetic polyneuropathy (DPN) and functional limitation due to carpal tunnel syndrome (CTS) represent two common complications associated with type 2 diabetes, significantly impacting the quality of life for affected individuals. DPN involves damage to peripheral nerves, resulting in symptoms ranging from tingling and numbness to pain and muscle weakness. On the other hand, carpal tunnel syndrome (CTS), which is defined by compression of the median nerve as it travels through the carpal tunnel in the wrist, can cause numbness, weakness, and reduced function in the hands. **Aims and Objectives:** This study's main goals are to determine the prevalence of diabetic polyneuropathy (DPN) and functional limitations brought on by carpal tunnel syndrome (CTS) in people with type 2 diabetes in the Twin Cities and to examine the relationships between demographic factors (such as age, gender, and marital status) and the prevalence of DPN and functional limitations in the study population. **Materials and methods:** Using a convenient technique for sampling, a cross-sectional survey was conducted. Using the Open Epi tool, a sample size of 384 was determined. The questionnaire was filled out by 384 participants in total, and there were no non-respondents. From the study's study setting, which included both public and private setups, data were gathered between June and September. Individuals with type 2 diabetes were among the target population. The Boston Carpal Tunnel Questionnaire and the Douleur-Neuropathique-4 questionnaire served as the research tools. **Data analysis:** Data analysis was done on an IBM SPSS sheet. Results: 312 subjects (81.3%) out of 384 got DN4>4=positive results. With a P value of 0.01, the relationship between age and neuropathy turns out to be extremely significant. Gender and neuropathy were found to be associated, with women experiencing higher neuropathy and more functional restrictions. **Conclusion:** As a result, our study discovered important details on the prevalence of peripheral neuropathy in people with type 2 diabetes, showing that it is in fact more common.

Introduction

Carpal tunnel syndrome (CTS) is a prevalent condition characterized by the compression of the median nerve as it passes through the carpal tunnel in the wrist. This compression leads to a range of symptoms, including numbness, tingling, weakness, and pain in the hand and fingers. The condition is often associated with repetitive wrist movements, making it common among individuals engaged in activities that require prolonged use of the hands, such as typing, assembly line work, and certain sports. CTS can significantly impact an individual's quality of life, affecting their ability to perform daily tasks and work-related activities.

CTS can be classified into three categories based on severity: mild, moderate, and severe. Mild CTS typically lasts less than one year, with intact two-point discrimination and no weakness or atrophy. In moderate CTS, symptoms may persist longer, with some abnormalities detected in two-point discrimination and minimal weakness. Severe CTS is characterized by significant symptoms lasting over a year, marked abnormalities in sensory function, and pronounced weakness and atrophy of the muscles innervated by the median nerve. Electromyography (EMG) and nerve conduction studies (NCS) are essential diagnostic tools used to assess the severity of CTS and guide treatment options (LeBlanc, 2011).

Diabetes mellitus is a significant risk factor for developing CTS. This metabolic disorder is characterized by the body's inability to produce or respond adequately to insulin, leading to elevated blood glucose levels. Diabetes can result in

a range of complications, including diabetic polyneuropathy (DPN), which affects the peripheral nerves and can exacerbate the symptoms of CTS. The relationship between diabetes and CTS is complex, as individuals with diabetes are more likely to experience CTS, and those with DPN often have more severe manifestations of the condition.

Research indicates that the prevalence of CTS is significantly higher in individuals with diabetes, particularly among those with DPN. Studies have shown that approximately 14% of diabetic patients without DPN and 30% of those with DPN experience CTS (Yan Zhang, 2021). The risk of developing CTS increases substantially in patients with DPN, underscoring the importance of early detection and intervention. Furthermore, the presence of both conditions can lead to a decline in hand function, affecting grip strength and tactile sensitivity.

Understanding the mechanisms underlying CTS, particularly in the context of diabetes, is crucial for developing effective diagnostic and therapeutic strategies. Compression and traction of peripheral nerves result in entrapment neuropathy, leading to aberrant microcirculation, myelin sheath damage, and changes in the connective tissue surrounding the nerves. In diabetic patients, postoperative outcomes following carpal tunnel release surgery are often less favorable compared to non-diabetic individuals, suggesting that factors such as hyperglycemia and a lack of neurotrophic substances may contribute to the severity of CTS (Aboonq, 2015). The diagnosis of CTS typically involves a combination of clinical evaluation and electrodiagnostic testing. Clinicians assess the patient's medical history and symptoms, focusing on the distribution of sensory loss and pain. Tinel's sign and Phalen's test are commonly used clinical tests to elicit symptoms and support the diagnosis. However, these tests may not always be reliable, particularly in the presence of DPN, which can obscure the clinical picture.

In conclusion, CTS is a multifaceted condition that poses significant challenges for affected individuals, particularly those with diabetes. The interplay between CTS and diabetic neuropathy necessitates a thorough understanding of their underlying mechanisms to improve diagnosis and treatment outcomes. Future research should focus on elucidating the pathophysiological connections between these conditions and developing targeted interventions to enhance the quality of life for patients suffering from both CTS and diabetes. By advancing our knowledge in this area, we can pave the way for more effective management strategies and ultimately improve patient care.

Materials and Methods

1. Study Design:

This study utilized a cross-sectional survey design to assess the relationship between type 2 diabetes, carpal tunnel syndrome (CTS), and polyneuropathy.

2. Sample Size:

The sample size was determined using the Open EPI Tool, resulting in an estimated total of 384 participants. The target population consisted of individuals with type 2 diabetes who also exhibited symptoms of CTS and polyneuropathy.

3. Sampling Technique:

Convenience sampling was employed to select participants for the study.

4. Study Setting:

The research was conducted in hospitals and clinics to ensure accessibility and relevance to the research topic.

5. Sample Selection:

Participants who met the inclusion criteria were selected through convenience sampling.

Inclusion Criteria:

- Male and female participants.

- Age groups: 18-30, 31-45, and 46-60 years.

- Diagnosed with type 2 diabetes.

- Presence of polyneuropathic pain and CTS.

- Residents of two cities in Pakistan.

- Willingness and accessibility to attend study visits.

Exclusion Criteria:

- Patients with type 1 diabetes or gestational diabetes.

- Presence of other chronic pain conditions unrelated to diabetes or CTS.

- Patients with severe cognitive impairment.

- History of major trauma or surgery in the past year that could affect pain reporting.

- Individuals unable to provide informed consent.

Demographic Variables:

Data on participants' demographics were collected using a structured questionnaire that included seven questions regarding name, age, gender, marital status, place of residence, occupation, and any physical ailments.

Identification of Variables:

Dependent Variables: Presence of neuropathic pain and functional limitations due to CTS, assessed through specific daily activities such as writing, buttoning clothes, holding a book, gripping a telephone, opening jars, performing household chores, carrying grocery bags, bathing, and dressing.

- **Independent Variables:** Age, gender, and marital status.

Data Collection Method:

Participants completed a questionnaire that included the Boston Carpal Tunnel Questionnaire Functional Status Scale and the Douleur-Neuropathique-4 questionnaire, along with a demographic form. Informed consent was obtained from all participants, and confidentiality was maintained. Data collection occurred from March to September 2023, achieving a 100% response rate.

Carpal Tunnel Syndrome (CTS) Measurement:

The Boston Carpal Tunnel Questionnaire Functional Status Scale was used to evaluate the impact of CTS on daily activities. Participants rated eight activities on a five-point scale, ranging from "no difficulty" to "cannot do at all due to symptoms." The questionnaire was self-administered and typically took 3–5 minutes to complete.

DN-4 Measurement:

The Douleur-Neuropathique-4 questionnaire assessed the probability of neuropathic pain among participants. It consisted of four questions requiring "yes" or "no" answers, divided into an interview section and an examination section. Each "yes" response contributed one point, with a total score calculated out of 10. A score of 4 or above indicated a higher likelihood of neuropathic pain.

Statistical Analysis Procedure:

Data were analyzed using SPSS 21.0 IBM Software, with a significance level set at 0.05. The Chi-Square Test was employed to find associations between the dimensions of the Boston Carpal Tunnel Questionnaire, the Douleur-Neuropathique-4, and demographic variables such as age, gender, and marital status.

Ethical Considerations:

Ethical principles were strictly adhered to throughout the study, including obtaining informed consent, ensuring participant confidentiality, and preventing discrimination based on factors such as caste, color, or ethnicity.

Results:

The results of the study involving 384 type 2 diabetic patients are summarized as follows: In Table 1, the age distribution of the participants is presented. Among the cohort, 3 participants (0.8%) were in the age group of 18–30 years, 92 participants (24.0%) fell in the 31–45 age group, and the majority, comprising 289 participants (75.3%), were aged between 46 and 60 years. Table 2 showed into the gender distribution of the study. Out of the 384 participants, 126 (32.8%) were male, and 258 (67.2%) were female. Moving on to marital status, Table 3 provides insights. Among the 384 participants, 17 (4.4%) were unmarried, 351 (91.4%) were married, and 16 (4.2%) were either widowed or divorced. Examining the presence of polyneuropathic pain, as shown in Table 4, 72 participants (18.8%) tested negative (DN44=). Participants' difficulties in various daily activities were also assessed. In Table 5, it is observed that 162 participants (42.2%) had no difficulty in writing, 74 (19.3%) had mild difficulty, 85 (22.1%) had moderate difficulty, 53 (13.8%) experienced severe difficulty, and 10 (2.6%) participants could not write due to their symptoms. Table 6 examines the difficulty participants faced in buttoning clothes. Results indicated that 154 participants (40.1%) had no difficulty, 72 (18.8%) had mild difficulty, 84 (21.9%) had moderate difficulty, 57 (14.8%) reported severe difficulty, and 27 (7.0%) participants were unable to button their clothes due to their symptoms. Furthermore, Table 7 investigated the difficulty participants experienced in holding a book. It revealed that 134 participants (34.9%) had no difficulty, 85 (22.1%) reported mild difficulty, 100 (26.0%) had moderate difficulty, 44 (11.5%) faced severe difficulty, and 21 (5.5%) participants could not hold a book due to their symptoms. In Table 8, the findings reveal the difficulty in gripping telephone handles among a population of 384 participants. Notably, 110 individuals (28.6%) reported having no difficulty gripping the telephone handle. Conversely, 89 participants (23.2%) experienced mild difficulty, while 109 participants (28.4%) faced moderate difficulty gripping the telephone handle. Additionally, 61 participants (15.9%) reported severe difficulty gripping the telephone handle, and 15 participants (3.9%) were unable to perform this task at all due to their symptoms. Moving to Table 9, which explores the difficulty in opening jars within the same population, 103 participants (26.8%) encountered no difficulty in opening jars. In contrast, 72 participants (18.8%) reported mild difficulty, while 84 participants (21.9%) experienced moderate difficulty with this household task. Furthermore, 76 participants (19.8%) faced severe difficulty, and 49 participants (12.8%) were unable to open jars at all due to their symptoms. Table 10 delves into the difficulty participants faced with household chores. Among the 384 individuals surveyed, 88 participants (22.9%) reported no difficulty in performing household chores, while 86 participants (22.4%) had mild difficulty. Moreover, 97 participants (25.3%) encountered moderate difficulty, 76 participants (19.8%) experienced severe difficulty, and 37 participants (9.6%) were unable to engage in household chores due to their symptoms. Table 11 investigates the challenges faced in carrying grocery bags. Out of the 384 participants, 76 individuals (19.8%) indicated no difficulty in this task, while 72 participants (18.8%) reported mild difficulty. Moreover, 98 participants (25.5%) encountered moderate difficulty, 78 participants (20.3%) faced severe difficulty, and 60 participants (15.6%) were unable to carry grocery bags at all due to their symptoms. In Table 12, the study explores the difficulties participants encountered in bathing and dressing. A significant majority of the population, comprising 192 individuals (50.0%), had no difficulty with these activities. 41 Conversely, 85 participants (22.1%) reported mild difficulty, 69 participants (18.0%) encountered moderate difficulty, 30 participants (7.8%) experienced severe difficulty, and 8 participants (2.1%) were unable to perform bathing and dressing tasks at all due to their symptoms. In Tables 13.1 and 13.2, an examination of the association

between age and the presence of neuropathic pain reveals a significant relationship, as indicated by a p-value of <0.05. It's important to highlight that our findings indicate women tend to experience a higher level of difficulty with household chores compared to men in our study.

Table13.1: Association of Age and Presence of Neuropathic pain

	presence of neuropathic pain		Total
	DN4 < 4 = negative	DN4 > 4 = Positive	
18-30 years	3	0	3
31-45 years	14	78	92
46-60 years	55	234	289
Total	72	312	384

Table 13.2

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.769[a]	2	.001
Likelihood Ratio	10.853	2	.004
N of Valid Cases	384		

Table 13.1, 13.2 As the p-value is <0.05, we observe a significant association between age and neuropathic pain. This suggests an increase in neuropathic pain incidence with increasing age, indicating a direct relationship between age and neuropathic pain.

Age and Difficulty In Bathing And Dressing

Table14.1: Association of Age and Difficulty in Bathing and Dressing

		bathing and dressing					Total
		no difficulty	mild difficulty	moderate difficulty	severe difficulty	cannot do at all due to symptoms	
age	18-30 years	2	0	1	0	0	3
	31-45 years	57	13	19	3	0	92
	46-60 years	133	72	49	27	8	289
Total		192	85	69	30	8	384

Table 14.2

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.145[a]	8	.056
Likelihood Ratio	18.686	8	.017
Linear-by-Linear Association	6.244	1	.012
N of Valid Cases	384		

Table 14.1, 14.2 As the p-value is 0.056, our analysis does not indicate a significant association between age and bathing difficulty level. Therefore, there is no observed relationship between age and bathing difficulty in our study.

Age And Difficulty In Opening Of Jars

Table 15.1: Association of Age and Difficulty in Opening of Jars

		opening of jars					Total
		no difficulty	mild difficulty	moderate difficulty	severe difficulty	cannot do at all due to symptoms	
age	18-30 years	1	1	0	1	0	3
	31-45 years	26	14	27	20	5	92
	46-60 years	76	57	57	55	44	289
Total		103	72	84	76	49	384

Table 15.2

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.029[a]	8	.200
Likelihood Ratio	12.773	8	.120
Linear-by-Linear Association	1.207	1	.272
N of Valid Cases	384		

Table 15.1, 15.2 As the p-value is 0.200, our analysis does not indicate a significant association between age and the difficulty level of opening jars. Therefore, there is no observed relationship between age and the difficulty level of opening jars in our study.

Age And Difficulty In Carrying Of Grocery Bags

Table 16.1: Association of Age and Difficulty in Carrying of Grocery Bags

	carrying of grocery bags					Total
	no difficulty	mild difficulty	moderate difficulty	severe difficulty	cannot do at all due to symptoms	
18-30 years	1	0	2	0	0	3
31-45 age years	21	20	19	22	10	92
46-60 years	54	52	77	56	50	289
Total	76	72	98	78	60	384

Table 16.2

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.602[a]	8	.377
Likelihood Ratio	9.711	8	.286
Linear-by-Linear Association	2.112	1	.146
N of Valid Cases	384		

Table 16.1, 16.2 As the p-value is 0.377, our analysis does not reveal a significant association between age and the difficulty level of holding a grocery bag. Hence, there is no observed relationship between age and the difficulty level of holding a grocery bag in our study

Age and Difficulty In Household Chores

Table 17.1: Association of Age and Difficulty in Household chores

		household chores					Total
		no difficulty	mild difficulty	moderate difficulty	severe difficulty	cannot do at all due to symptoms	
Age	18-30 years	1	0	2	0	0	3
	31-45 years	22	25	25	16	4	92
	46-60 years	65	61	70	60	33	289
Total		88	86	97	76	37	384

Table 17.2

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.233[a]	8	.323
Likelihood Ratio	10.722	8	.218
Linear-by-Linear Association	3.212	1	.073
N of Valid Cases	384		

Table 17.1, 17.2 As the p-value is 0.323, our analysis does not indicate a significant association between age and the difficulty level of household chores. Therefore, there is no observed relationship between age and the difficulty level of household chores in our study

Gender and Presence of Neuropathic Pain

Table 18.1: Association of Gender and Presence of Neuropathic Pain

	presence of neuropathic pain		Total
	DN4 < 4 = negative	DN4 > 4 = Positive	
gender male	31	95	126
female	41	217	258
Total	72	312	384

Table 18.2

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2sided)	Exact Sig. (1sided)
Pearson Chi-Square	4.217[a]	1	.040		
Continuity Correction[b]	3.665	1	.056		
Likelihood Ratio	4.082	1	.043		
Fisher's Exact Test				.051	.029
N of Valid Cases	384				

Table 18.1, 18.2 As the p-value is <0.05, we observe a significant association between gender and neuropathic pain. Specifically, our findings indicate that women have a higher prevalence of neuropathic pain in comparison to men in our study.

Gender and Difficulty In Bathing And Dressing

`**Table 19.1:** Association of Gender and Difficulty in Bathing and Dressing

		bathing and dressing					Total
		no difficulty	mild difficulty	moderate difficulty	severe difficulty	cannot do at all due to symptoms	
Gender	Male	77	31	14	3	1	126
	Female	115	54	55	27	7	258
Total		192	85	69	30	8	384

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.633[a]	4	.001
Likelihood Ratio	20.753	4	.000
N of Valid Cases	384		

Table19.1 , 19.2 As the p-value is <0.05, we find a significant association between gender and bathing difficulty level. Notably, our analysis reveals that women experience a higher level of difficulty with bathing compared to men in our study.

Gender and Difficulty In Opening Of Jars

Table 20.1: Association of Gender and Difficulty in Opening of Jars

		opening of jars					Total
		no difficulty	mild difficulty	moderate difficulty	severe difficulty	cannot do at all due to symptoms	
Gender	male	46	25	25	18	12	126
	female	57	47	59	58	37	258
Total		103	72	84	76	49	384

Table 20.2

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.444[a]	4	.022
Likelihood Ratio	11.386	4	.023
N of Valid Cases	384		

Table 20.1, 20.2 As the p-value is <0.05, we have identified a significant association between gender and the difficulty level of opening jars. It's worth noting that our findings indicate women tend to experience a higher level of difficulty when it comes to opening jars compared to men in our study.

Gender and Difficulty in Carrying Of Grocery Bags

Table 21.1: Association of Gender and Difficulty in Carrying of Grocery Bags

		carrying of grocery bags					Total
		no difficulty	mild difficulty	moderate difficulty	severe difficulty	cannot do at all due to symptoms	
gender	Male	37	39	21	16	13	126
	Female	39	33	77	62	47	258
Total		76	72	98	78	60	384

Table 21.2

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	38.071[a]	4	.000
Likelihood Ratio	37.689	4	.000
N of Valid Cases	384		

Table 21.1, 21.2 As the p-value is <0.05, we have uncovered a significant association between gender and the difficulty level of holding grocery bags. Notably, our analysis shows that women experience a higher level of difficulty when it comes to holding grocery bags compared to men in our study.

Gender And Difficulty In Household Chores

Table 22.1: Association of Gender and Difficulty in Household Chores

	household chores					Total
	no difficulty	mild difficulty	moderate difficulty	severe difficulty	cannot do at all due to symptoms	
gender Male	47	32	18	20	9	126
Female	41	54	79	56	28	258
Total	88	86	97	76	37	384

Table 22.2

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.294[a]	4	.000
Likelihood Ratio	29.183	4	.000
N of Valid Cases	384		

Table22.1, 22.2 As the p-value is <0.05, we have identified a significant association between gender and the difficulty level of performing household chores. It's important to highlight that our findings indicate women tend to experience a higher level of difficulty with household chores compared to men in our study.

DISCUSSIONS

The results of this study provide valuable insights into the demographic characteristics and prevalence of neuropathic pain and its impact on daily activities among type 2 diabetic patients. These findings offer a comprehensive understanding of the challenges faced by individuals in this population and shed light on potential areas of intervention and support.

Prediabetes, according to a study by Bruce Perkins, is associated with a similar risk of peripheral neuropathy and nerve damage in those who have several diabetes risk factors even if it is not linked to the metabolic syndrome.

In contrast to Bruce Perkins' study on the subject, neuropathy was present in people in the 48–64 age range who were at high risk for type 2 diabetes. We conducted a study on prevalence of diabetic polyneuropathy in type 2 diabetes and its association with demographic factors, in this study ratio of polyneuropathy is high in age group of 45-60 years.

Carpal tunnel syndrome (CTS), according to the MalnZimmerin study, is a frequent compressive neuropathy that is more prevalent in people with type 1 and type 2 diabetes. Although the exact origin is unknown, structural and metabolic alterations in the peripheral nerve are probably to blame.

Maln Zimmerin's study revealed that women had a type 2 diabetes prevalence of 10.1% while men had a 5% prevalence. Men and women experience CTS presentation differently as a result of diabetic neuropathy. Due to the increased prevalence and earlier onset of diabetes in men, electrophysiological results are often worse when they are presented. In contrast, we discovered that females outnumbered men by up to 67.2%.

The existence of neuropathy, older age, and female sex were the three most significant risk variables for CTS as showed in study of Giancarlo Comi and Luigi Lozza.. The duration of hyperglycemia was associated with polyneuropathy but not CTS.

The study was conducted by Giancarlo Comi and Luigi Lozza on presence of CTS in diabetic patients, out of total population 11.2 % patients showed CTS in which female ratio was four times higher than males. In contrast we had found the female ratio up-to 7 times higher in performing household chores than men.

The study conducted by S Jambart on prevalence of DPN in diabetic patients, they concluded that DPN was >4 almost 53.7% in type 2 diabetic patients and higher in females with age group 47-69 years. In contrast we concluded that DPN was positive at 81.3 % and higher in females with age group of 46-60 years.

Jian-bin Su, Li-hua Zhao, and Xiu-lin Zhang thoroughly collected clinical data and medical history from their cohort of patients for their study. The prevalence of DPN was 18.1% in the group of patients they recruited. In comparison, the prevalence of DPN was substantially greater in our study, coming in at 81.3%. It's important to highlight that both studies, including ours, found a strong association between type 2 diabetes and the existence of DPN.

Furthermore, compared to non-DPN patients (14.3%), those with chronic diabetes mellitus with polyneuropathy had a greater risk or accelerated rate of acquiring CTS (32.1%). CTS is more common in diabetics who also have diabetic polyneuropathy.

According to the statistical study, the rate of ploy neuropathy is indeed related to age, as we detected a significant increase in neuropathic pain with age. According to several studies, females and older persons are more likely to develop DPN. Furthermore, older age, neuropathy, and female sex can all raise the likelihood of developing CTS.

CTS is believed to affect 1-5% of the general population, with a female-to-male ratio of roughly 3:1. CTS impacted women more than men, presumably because to a smaller proximal carpal tunnel cross-sectional area or higher wrist usage. Diabetes is a significant risk factor for the development of CTS.DPN and CTS are frequently found combined, with women having a higher frequency. In our statistical research, we discovered a significant relationship between gender and polyneuropathic pain. In particular, our findings show that women in our study have a higher prevalence of pain than men.

Diabetic polyneuropathy can cause morbidity and reduce a person's quality of life by making it difficult to do regular ADLs such as washing, dressing, and opening a tight container, among other things.Our statistical research found no significant relationship between age and bathing level difficulty, and no relationship between age with opening of tight jars.

According to some studies, diabetes mellitus (DM) is a chronic condition marked by hyperglycemia and a number of complications, including diabetic hand syndrome (DHS), which is characterized by the co-existence of distinct conditions like limited joint mobility (LJM), Dupuytren's disease (DD), flexor tenosynovitis (FTS), and carpal tunnel syndrome (CTS), all of which cause significant morbidity and mortality. Significant predictors of painful DPN included female gender, a long history of diabetes (10 years), and these factors together. We found a correlation between gender and the amount of domestic work difficulty. It is significant to note that our findings suggest that women in our study experience greater levels of household trouble than men.

A study demonstrated a link to analyze how type 2 diabetes affects the handgrip in relation to gender, revealing that the result is more prevalent in females than men, with a decrease in hand gripping power. We discovered a strong relationship between gender and the difficulty level of opening jars. It's worth noting that our data show that when it comes to opening jars, women had a higher amount of difficulty than men in our study.

In a study by Monsiha D'Souza and Vaman Kulkarni, it was discovered that patients older than 40, those whose fasting blood glucose (FBG) was higher than 120 g/dL, those who were single, widowed, or divorced, and those whose duration of DM was longer than 10 years had a higher prevalence of DPN. However, the association was not statistically significant. While we also discovered, there was also no conclusive evidence of a link between DPN and married status.

In contrast, our research produced several new ideas. The prevalence of DPN was shown to be significantly correlated with gender, with a higher frequency in the female population. Interestingly, we discovered no statistically significant association between marital status and the occurrence of DPN, which is similar to D'Souza and Kulkarni's findings in this regard.

Our thorough investigation of neuropathic pain and how it affects type 2 diabetic patients' daily activities has uncovered important details on the prevalence and demographics of these problems. Our work shed light on the intricate relationships between age, gender, and peripheral neuropathy in the setting of carpal tunnel syndrome (CTS) and diabetic polyneuropathy (DPN).In outcome, this study adds to what is already known about the neuropathic consequences of type 2 diabetes and their relationship to demographic parameters. Our findings illustrate the complexity and multidimensional character of these problems by challenging certain accepted connections while supporting others. These results lay the groundwork for further research and the creation of focused therapies aimed at enhancing the lives of people coping with these difficult situations.

LIMITATIONS

It is important to acknowledge the limitations of our study. First, a subset of patients showed excessive responses, probably in anticipation of being given medication in exchange for their involvement, as we noticed. The accuracy of the information they provided may have been impacted by this bias put into the data. Second, because some patients exhibited shy behavior, some responses' accuracy was hampered. Shyness can result in underreporting or an unwillingness to divulge specific facts, which could have an impact on how complete our dataset is.

Another notable limitation was the inclusion of patients with critical health issues, such as stroke, and those suffering from chronic conditions like autoimmune diseases. These individuals may have been dealing with their primary health concerns, which could have influenced the accuracy and completeness of their responses to our study's questions. Furthermore, some elderly participants faced vocal issues, which posed challenges to their ability to provide clear and coherent responses. This limitation may have affected the quality of the information we collected from these individuals.

Lastly, we encountered patients with psychological issues, particularly anxiety, which could have further disrupted their responses. The presence of anxiety may have influenced their ability to recall and convey accurate information during the study. These limitations should be considered when interpreting the results of our research, and future studies may benefit from addressing these challenges through improved participant selection and data collection techniques.

5.1 CONCLUSION

As a result, our study discovered important details on the prevalence of peripheral neuropathy in people with type 2 diabetes, showing that it is in fact more common. Furthermore, we have found that gender and age both have a big impact on how common peripheral neuropathy is,

highlighting the significance of taking these aspects into account while managing diabetes. It's interesting to note that there was no statistically significant link between marital status and peripheral neuropathy.

Furthermore, we found that gender is a significant influencing factor in functional restrictions brought on by carpal tunnel syndrome (CTS). Contrary to peripheral neuropathy, functional impairments brought on by CTS did not significantly correlate with age or the presence of neuropathy itself.

These findings highlight the complexity of diabetes-related complications and the significance of customizing healthcare interventions to take into account the relevant demographic characteristics. Such understandings have the potential to improve the accuracy and efficacy of diabetes care, thereby enhancing the quality of life for those who are affected.

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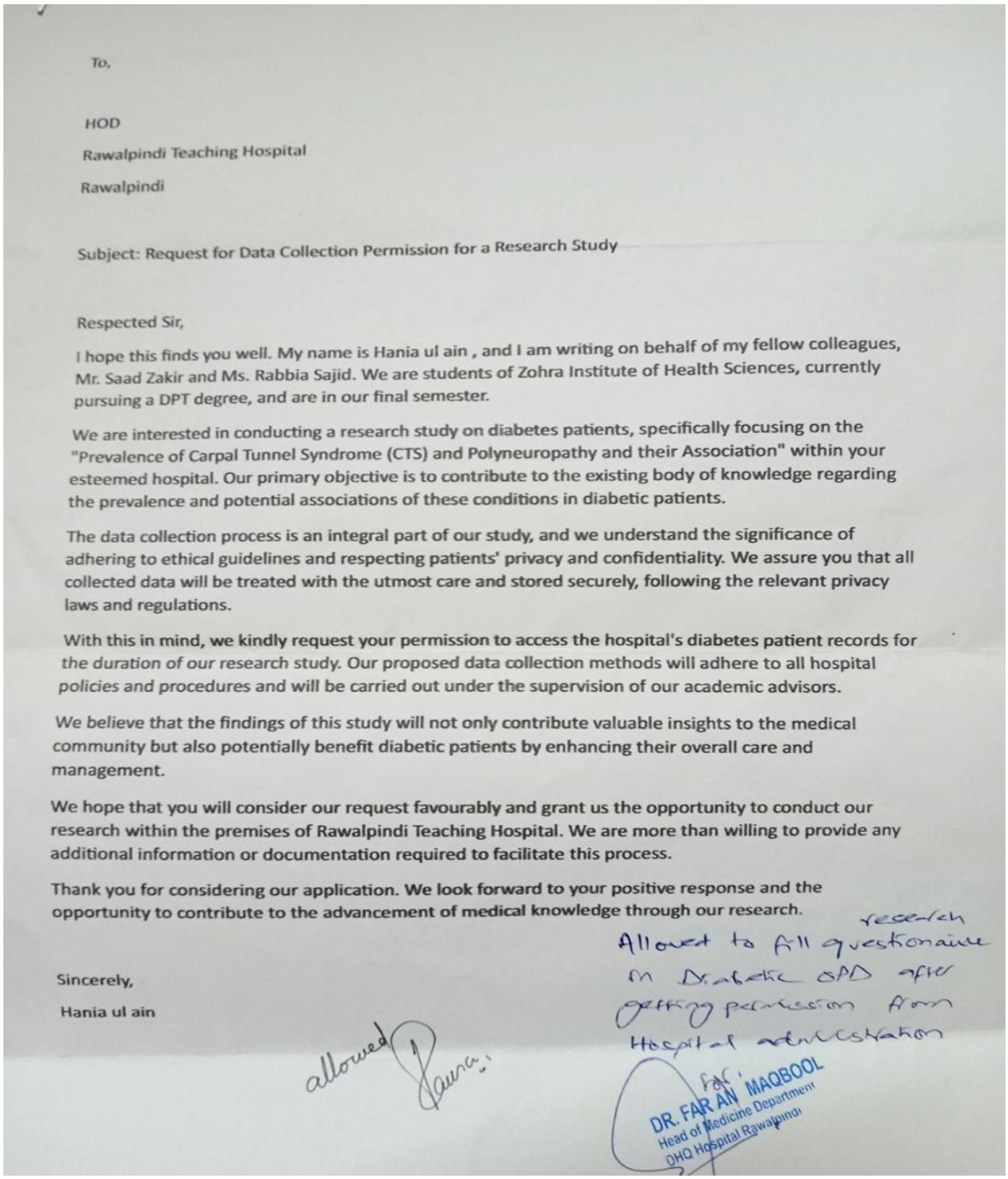
APPENDIX



To,

HOD

Rawalpindi Teaching Hospital

Rawalpindi

Subject: Request for Data Collection Permission for a Research Study

Respected Sir,

I hope this finds you well. My name is Hania ul ain , and I am writing on behalf of my fellow colleagues, Mr. Saad Zakir and Ms. Rabbia Sajid. We are students of Zohra Institute of Health Sciences, currently pursuing a DPT degree, and are in our final semester.

We are interested in conducting a research study on diabetes patients, specifically focusing on the "Prevalence of Carpal Tunnel Syndrome (CTS) and Polyneuropathy and their Association" within your esteemed hospital. Our primary objective is to contribute to the existing body of knowledge regarding the prevalence and potential associations of these conditions in diabetic patients.

The data collection process is an integral part of our study, and we understand the significance of adhering to ethical guidelines and respecting patients' privacy and confidentiality. We assure you that all collected data will be treated with the utmost care and stored securely, following the relevant privacy laws and regulations.

With this in mind, we kindly request your permission to access the hospital's diabetes patient records for the duration of our research study. Our proposed data collection methods will adhere to all hospital policies and procedures and will be carried out under the supervision of our academic advisors.

We believe that the findings of this study will not only contribute valuable insights to the medical community but also potentially benefit diabetic patients by enhancing their overall care and management.

We hope that you will consider our request favourably and grant us the opportunity to conduct our research within the premises of Rawalpindi Teaching Hospital. We are more than willing to provide any additional information or documentation required to facilitate this process.

Thank you for considering our application. We look forward to your positive response and the opportunity to contribute to the advancement of medical knowledge through our research.

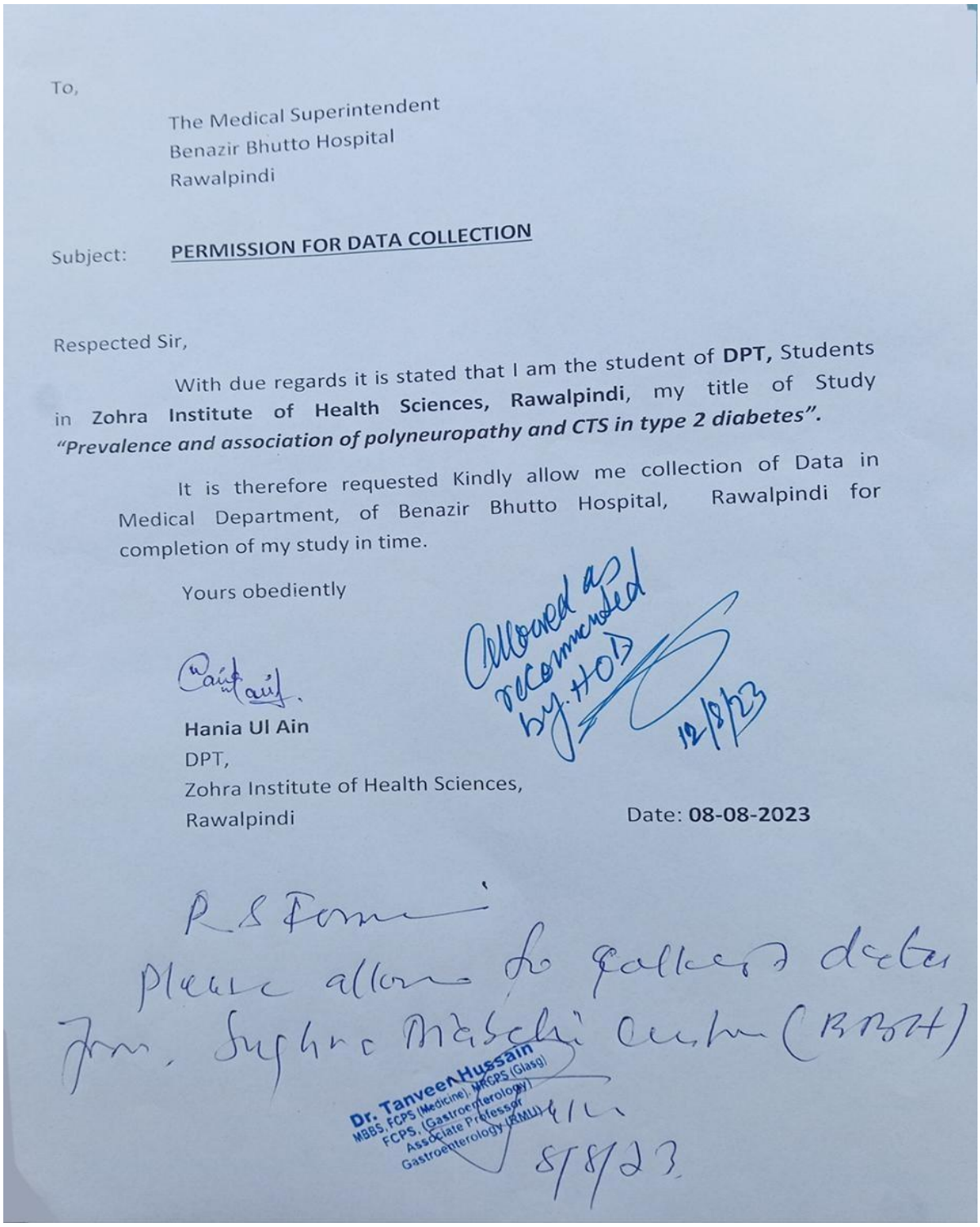
Sincerely,

Hania ul ain

allowed research

Allowed to fill questionaire on Diabetic OPD after getting permission from Hospital administration

For,
DR. FARAN MAQBOOL
Head of Medicine Department
DHQ Hospital Rawalpindi



To,

The Medical Superintendent
Benazir Bhutto Hospital
Rawalpindi

Subject: **PERMISSION FOR DATA COLLECTION**

Respected Sir,

With due regards it is stated that I am the student of **DPT,** Students in **Zohra Institute of Health Sciences, Rawalpindi**, my title of Study ***"Prevalence and association of polyneuropathy and CTS in type 2 diabetes".***

It is therefore requested Kindly allow me collection of Data in Medical Department, of Benazir Bhutto Hospital, Rawalpindi for completion of my study in time.

Yours obediently

Allowed as recommended by HOD 12/8/23

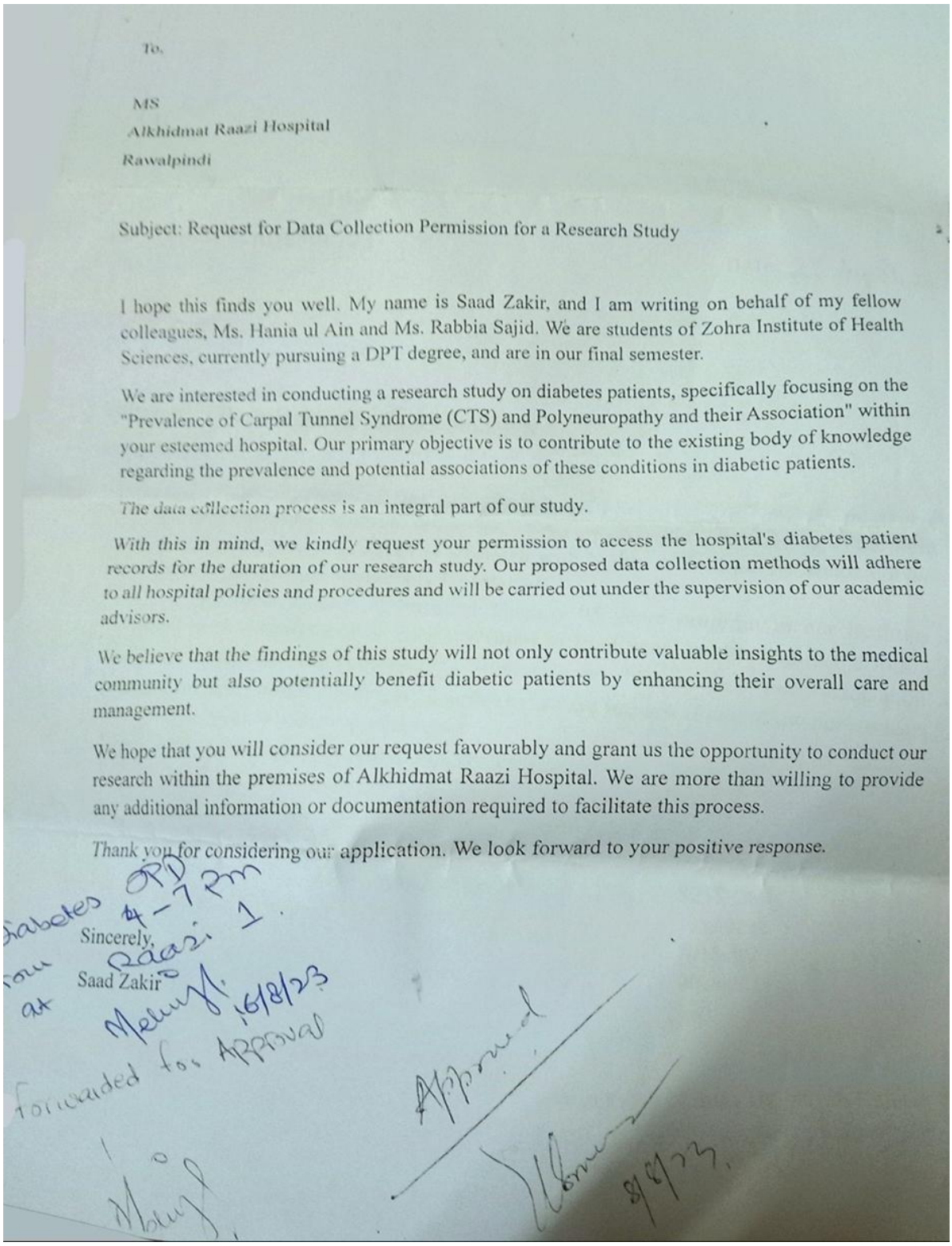
Hania Ul Ain
DPT,
Zohra Institute of Health Sciences,
Rawalpindi

Date: **08-08-2023**

R/S Form
Please allow to collect data
from Zohra Medical Centre (BBH)

Dr. Tanveer Hussain
MBBS, FCPS (Medicine), MRCPS (Glasg)
FCPS (Gastroenterology)
Associate Professor
Gastroenterology (RMU)

8/8/23



To,

MS
Alkhidmat Raazi Hospital
Rawalpindi

Subject: Request for Data Collection Permission for a Research Study

I hope this finds you well. My name is Saad Zakir, and I am writing on behalf of my fellow colleagues, Ms. Hania ul Ain and Ms. Rabbia Sajid. We are students of Zohra Institute of Health Sciences, currently pursuing a DPT degree, and are in our final semester.

We are interested in conducting a research study on diabetes patients, specifically focusing on the "Prevalence of Carpal Tunnel Syndrome (CTS) and Polyneuropathy and their Association" within your esteemed hospital. Our primary objective is to contribute to the existing body of knowledge regarding the prevalence and potential associations of these conditions in diabetic patients.

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With this in mind, we kindly request your permission to access the hospital's diabetes patient records for the duration of our research study. Our proposed data collection methods will adhere to all hospital policies and procedures and will be carried out under the supervision of our academic advisors.

We believe that the findings of this study will not only contribute valuable insights to the medical community but also potentially benefit diabetic patients by enhancing their overall care and management.

We hope that you will consider our request favourably and grant us the opportunity to conduct our research within the premises of Alkhidmat Raazi Hospital. We are more than willing to provide any additional information or documentation required to facilitate this process.

Thank you for considering our application. We look forward to your positive response.

Sincerely,

Saad Zakir