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Assessment of Pain and Temperature Sensitivity in Patients with Diabetes Mellitus: Correlation with Complications and Development of Early Diagnostic Methods for Neuropathy

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Annotation: Diabetic neuropathy is one of the most common and disabling complications of diabetes mellitus, significantly reducing the quality of life for patients. Early detection of changes in pain and temperature sensitivity can aid in the timely diagnosis of neuropathy and prevent its progression. Therefore, the development of accessible and effective methods for assessing sensitivity is an important task for improving diagnosis and monitoring the condition of patients with diabetes mellitus. Given the growing prevalence of diabetes worldwide, timely intervention in the management of complications like neuropathy is of increasing significance in clinical practice.

Keywords: Diabetic neuropathy, diabetes mellitus, pain sensitivity, temperature sensitivity, early diagnosis, complication management, patient monitoring.

Research Objective:

The primary objective of this study is to conduct a thorough assessment of changes in both pain and temperature sensitivity in patients diagnosed with diabetes mellitus. The research aims to examine the relationship between these sensory alterations and the onset or progression of diabetic neuropathy. Furthermore, the study seeks to develop and recommend accessible, non-invasive methods for early detection of such complications, with the goal of preventing further deterioration in the health of diabetic patients. By identifying early sensory changes, healthcare

providers may be better equipped to intervene promptly and reduce the burden of neuropathy in clinical practice.

Research Materials and Methods:

This study was carried out at the National Medical Centre and involved a cohort of 25 individuals who had been previously diagnosed with diabetes mellitus. Careful selection was made to ensure a diverse representation in terms of patients' age groups, gender, and duration of illness in order to capture a broad range of clinical presentations.

The methodology was structured as follows:

1. **Pain Sensitivity Measurement:**

Pain sensitivity was evaluated using a sterile needle applied to symmetrical areas on both sides of the body (e.g., hands, feet). This technique allowed for detection of local or generalized decreases in nociceptive (pain) perception, which is often an early indicator of nerve impairment. Any noticeable reduction in the patients' responses to this stimulus was carefully recorded.

2. **Temperature Sensitivity Assessment:**

Thermal sensitivity was tested using containers of warm and cold water. Each patient's response to alternating temperature exposures was documented. The test helped in evaluating their ability to distinguish between thermal stimuli, an important function that is commonly diminished in early neuropathic stages.

3. **Patient Interviews:**

Detailed interviews were conducted with each participant to collect subjective data. Questions focused on the presence and characteristics of symptoms such as burning sensations, tingling, numbness, and unexplained pain—common indicators of neuropathic involvement. The qualitative insights gained from these interviews enriched the overall understanding of the condition's impact on daily life.

4. **Demographic and Clinical Data Collection:**

All participating patients were clinically diagnosed with diabetes mellitus. Additional data were collected regarding their age, sex, duration of disease, lifestyle factors, and glycemic control status. This information was crucial in identifying any patterns or trends that may influence sensory changes.

The combined findings from physical assessments and subjective reports were analyzed using statistical methods to identify correlations between sensory deficits and the clinical signs of diabetic neuropathy.

Research Results:

The analysis revealed a clear and significant pattern of altered sensory function among the diabetic patients studied.

Patient Name & Surname	Glucose Level (mmol/L)	Pain Sensitivity (0-10)	Temperature Sensitivity (0-10)	Anamnesis Sensitivity
Shukhrat Tursunov	8.4	6	7	Reduced
Nodirbek Murodov	8.6	5	6	Normal
Zafarbek Jalilov	8.2	7	8	Reduced
Dilshodbek Rasulov	8.5	6	7	Reduced
Sardorbek Qodirov	8.7	6	6	Normal
Akmalbek Ikromov	8.8	7	5	Reduced
Shavkatbek Iskandarov	8.9	6	6	Normal
Gulomjonbek Umarov	8.1	5	6	Normal
Azizbek Yuldashev	8.3	8	8	Reduced
Farhodbek Anvarov	8.6	7	7	Reduced
Dilnoza Mukhammadieva	9.1	5	6	Reduced
Jamshidbek Tashkentov	9.2	6	7	Reduced
Ravshanbek Sattarov	9.3	6	6	Reduced
Akrambek Xolmatov	9.4	7	7	Normal
Firdavsbek Babajonov	9.5	8	8	Reduced
Azizbek Zokirov	8.7	6	5	Reduced
Narzulla Uktamov	9.1	5	6	Normal
Shavkatbek Bakiev	9.6	6	7	Normal
Ozodbek Shukurov	9.7	5	7	Reduced
Maftuna Karimova	10.0	6	6	Normal
Rustambek Shodiev	10.3	7	8	Reduced
Narimonbek Bakhtiyorov	10.5	6	5	Normal
Mirzaali Usmanov	10.8	8	7	Reduced
Ulugbek Saidov	11.0	6	6	Normal
Saida Bazarova	11.2	5	5	Reduced
Nargiza Tojiboeva	11.5	7	6	Reduced

Notably:

- **Pain Sensitivity:**

A marked reduction in pain sensitivity was identified in the majority of patients, particularly in those with a longer history of diabetes (over five years). This reduction was most frequently observed in distal regions such as the toes and fingers, consistent with the typical "glove and stocking" distribution seen in peripheral neuropathy.

- **Temperature Sensitivity:**

Thermal sensitivity testing showed that many patients exhibited delayed or absent responses to both warm and cold stimuli. This diminished thermal perception further supports the presence of subclinical neuropathic changes that may precede more severe complications.

- **Symptom Correlation:**

There was a strong correlation between objective findings (reduced pain and temperature sensitivity) and subjective symptoms reported during interviews. Many patients experiencing sensory loss also described classic neuropathic complaints, including persistent numbness, tingling sensations, and episodic burning pain in the extremities.

These results suggest that loss of sensitivity is not only a frequent occurrence in diabetic patients but also a potentially valuable early warning sign of neuropathic complication development.

Conclusion:

This study underscores the clinical importance of monitoring changes in pain and temperature sensitivity as early markers of diabetic neuropathy. The findings confirm that even simple, low-cost, non-invasive tests—such as needle pricking for pain assessment and warm/cold water for thermal evaluation—can play a crucial role in the early detection of neuropathic symptoms.

Incorporating these methods into routine diabetic check-ups can significantly enhance timely diagnosis, allow for earlier therapeutic intervention, and potentially slow the progression of neuropathy. Such preventative strategies are vital, considering the chronic nature of diabetes and the high burden of its complications on patients and healthcare systems alike.

The study recommends broader implementation of these diagnostic approaches across primary and specialist care settings. Moreover, further research involving larger and more diverse patient

populations is strongly encouraged to validate the effectiveness of these screening methods and to explore their integration into standardized diabetic care protocols.

By promoting early identification of neuropathic changes, this research contributes meaningfully to the optimization of clinical management strategies and paves the way toward improved long-term outcomes for individuals living with diabetes.

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