**Journal of Advanced Medical and Dental Sciences Research**

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr UGC approved journal no. 63854

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805 SJIF (Impact factor) 2017= 6.261; Index Copernicus value 2016 = 76.77

# Original Article

# Comparative Analysis of Pain Response at Fasting and Postprandial in Young Diabetic Adults

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***ABSTRACT:***
**Background:** Diabetes is one of the leading causes of mortality globally. According to World Health Organization statistics published in 2013, approximately 347 million people worldwide suffer from diabetes, and by 2030 diabetes will be the seventh leading cause of death. **Aim of the study:** To compare pain response in diabetic young population. **Materials and methods:** The study was conducted in the Department of Human Physiology of the medical institute. The study was approved from the ethical committee prior to commencement of the study. For the study, we selected subjects from the outpatient department of the hospital. We selected diabetic subjects ranging from the age of 18-25 years. The plasma glucose of each subject was estimated prior to including in the study. **Results:** A total of 50 subjects participated in the study. The number of male subjects was 31. The mean age of the subjects was 22.21 years. The pain threshold and pain tolerance are statistically significant parameters whereas, pain rating is statistically non-significant. **Conclusion**: From the results of present study, we conclude that pain response is more as compared to postprandial.
**Key words:** Diabetes, Pain Response.

Received: 20 February 2018 Revised: 2 March 2018 Accepted: 4 March 2018

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**This article may be cited as:** Tiu DN, Agarwal A. Comparative Analysis of Pain Response at Fasting and Postprandial in Young Diabetic Adults. J Adv Med Dent Scie Res 2018;6(7):144-147.

## INTRODUCTION:

Diabetes is one of the leading causes of mortality globally.[1] According to World Health Organization statistics published in 2013, approximately 347 million people worldwide suffer from diabetes, and by 2030 diabetes will be the seventh leading cause of death.[2] Type 2 diabetes mellitus is a disease that can lead to a progressive insulin secretory defect on top of insulin resistance.[3] Many studies have indicated that its incidence is related to age, obesity, family inheritance, impaired glucose metabolism, and a sedentary lifestyle.[4-9] People who do not manage their blood glucose levels well often suffer from persistent hyperglycemia, leading to an increase in the production of advanced glycation end products, and causing stiffness of connective tissue and subsequent aggravated musculoskeletal pain.[10]Research into painlessness in diabetes is scarce. Early studies date back to Pamela Margaret Le Quesne[11] and her group almost 30 years ago. They tried to measure the pain perception (nociception) at the diabetic foot by pinching the skin with a custom made "pinchometer". The results were inconclusive at best.[12] Other authors designed calibrated tools for assessing hypersensitivity of so-called symptomatic, i.e., painful, diabetic neuropathy (SDN, see below). To this end, pinprick pain perception, axon-reflex reaction and temperature detection of the skin were studied.[13, 14]Hence, the present study was conductedto compare pain response in diabetic young population.

## MATERIALS AND METHODS:

The study was conducted in the Department of Human Physiology of the medical institute between January to June 2017. The study was approved from the ethical committee prior to commencement of the study. For the study, we selected subjects from the outpatient department of the hospital. We selected diabetic subjects ranging from the age

of 18-25 years. The plasma glucose of each subject was estimated prior to including in the study. Subjects with plasma glucose less than 70 mg/dl and more than 200 mg/dl were excluded from the study. Subjects with bone disorder, cardiac disorder and endocrine disorder were removed from the study. A total of 50 patients were selected. The pain perception was checked using CPT on each subject two times, once in the fasting condition and again, after half an hour of eating food. Time of immersion, pain threshold, pain tolerance was recorded using two separate stop watches and pain rating was obtained on visual analogue scale (amount of pain reported by the subject at the end of CPT on a scale of 0 [no pain] to 10 [maximum pain bearable]) from each subject, immediately after CPT.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistical significant.

**RESULTS:**

A total of 50 subjects participated in the study. The number of male subjects was 31. The mean age of the subjects was 22.21 years. Mean plasma glucose level of subjects at fasting stage was 88.21 mg/dl and at postprandial stage was 141.12 mg/dl. The pulse at fasting was at 74 and postprandial was 81. The plasma glucose level and pulse were statistically significant. [Table1] Table 2 shows the corelation of blood glucose and pain sensitive parameters. We observed that pain threshold and pain tolerance are statistically significant parameters whereas, pain rating is statistically non-significant.

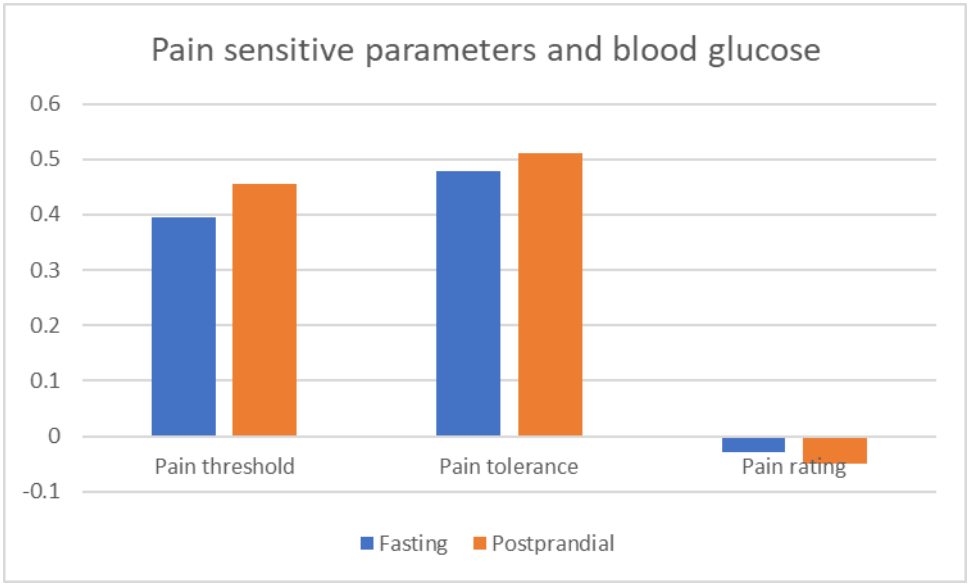
**Table 1: Demographic data and basal parameters**

| **Parameters** | **Mean value** | | **p-value** |
|---|---|---|---|
| Total number of subjects | 50 | | 0.21 |
| Mean age of the subjects, years | 22.21 | | 0.5 |
| Number of male subjects | 31 | | 0.31 |
| | **Fasting** | **Post prandial** | |
| Plasma glucose (mg/dl) | 88.21 | 141.12 | 0.001 |
| Pulse | 74 | 81 | 0.003 |

**Table 2: Corelation of blood glucose and pain sensitive parameters**

| **Parameters** | **Fasting** | **Postprandial** | **p-value** |
|---|---|---|---|
| Pain threshold | 0.396 | 0.456 | 0.002 |
| Pain tolerance | 0.478 | 0.512 | 0.004 |
| Pain rating | -0.03 | -0.05 | 0.122 |

Figure 1:



**DISCUSSION:**

In the present study, we compared pain response at fasting stage and postprandial stage. We observed that pain threshold and pain tolerance are statistically significant parameters whereas, pain rating is statistically non-significant.Bierhaus A et al reported that molecular events that result in loss of pain perception are poorly understood in diabetic neuropathy. Their results show that the receptor for advanced glycation end products (RAGE), a receptor associated with sustained NF-κB activation in the diabetic microenvironment, has a central role in sensory neuronal dysfunction. In sural nerve biopsies, ligands of RAGE, the receptor itself, activated NF-κBp65, and IL-6 colocalized in the microvasculature of patients with diabetic neuropathy. Activation of NF-κB and NF-κB–dependent gene expression was upregulated in peripheral nerves of diabetic mice, induced by advanced glycation end products, and prevented by RAGE blockade. NF-κB activation was blunted in RAGE-null (RAGE–/–) mice compared with robust enhancement in strain-matched controls, even 6 months after diabetes induction. Loss of pain perception, indicative of long-standing diabetic neuropathy, was reversed in WT mice treated with soluble RAGE. Raz Iet al studied the effect exerted by different hyperglycemic states on the pain threshold and on the analgesic potential of morphine in male Sabra rats with the hot plate device. Hyperglycemia induced by an intraperitoneal injection of 0.014 mol/kg glucose or an acute or chronic diabetic state induced by streptozocin injection did not significantly alter the pain threshold. However, states of acute and chronic diabetes markedly blunted the analgesic effect of morphine (5 mg/kg). Sabra rats maintained on a cocktail of glucose-saccharin, thought to activate the release of endogenous opioids, demonstrated an increased pain threshold and rapidly developed resistance to the analgesic effect of morphine. Previous studies have shown that glucose in high concentration may interfere with the interaction of morphine on the opiate receptor. The influence of the diabetic state on beta-endorphin synthesis and concentration in the central nervous system is another factor that might change pain perception in diabetes. [, 15, 16]

Morley GKet al reported that animal studies have suggested an altered response to opiate agonists and antagonists as well as an altered pain threshold in diabetic animals. They reported a study in which a 50 g glucose infusion in normal subjects resulted in a significant decrease in both the threshold level of pain and the maximal level of pain tolerated, as measured by responses to electrical pain induced by a Grass stimulator. In addition, patients with diabetes mellitus were hyperalgesic when compared with normal subjects. It is concluded that elevated glucose levels and/or rapid fluxes in glucose levels result in a decrease in pain tolerance. Pai L-W et al explored the 10-year cumulative incidence of musculoskeletal pain, the mean number of doctor visits for musculoskeletal pain, and the mean number of doctor visits for musculoskeletal pain by location in people with type 2 diabetes, compared with respective values for people without diabetes. The study utilized a population-based retrospective cohort study design. The subjects were randomly obtained from the Taiwan National Health Insurance Research Database. The diabetic group included 6586 people with type 2 diabetes aged 18–50 years, while the non-diabetic group consisted of 32,930 age- and sex-matched people. Results showed that people in the diabetic group had a higher 10-year cumulative incidence of and a higher mean number of doctor visits for musculoskeletal pain than the non-diabetic group. The relative risk (RR) of the 10-year cumulative incidence of musculoskeletal pain in the two groups was the highest (RR = 1.39) for people between 30 and 39 years of age. They concluded that people with type 2 diabetes aged 18–50 years had a higher 10-year cumulative incidence of and a higher mean number of doctor visits for musculoskeletal pain than the non-diabetic group.[17, 18]

**CONCLUSION:**

From the results of present study, we conclude that pain response is more as compared to postprandial.

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**Source of support:** Nil **Conflict of interest:** None declared