Increased Density of *Demodex folliculorum* Mites in Pregnanacies with Gestational Diabetes

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**Key Words**
*Demodex folliculorum* · Gestational diabetes · Pregnancy

**Abstract**

**Objective:** To investigate the presence of *Demodex* in patients with gestational diabetes and the impact of glucose regulation on *Demodex* density in gestational diabetes.

**Subjects and Methods:** The study population consisted of 33 patients with gestational diabetes and 30 pregnant women without gestational diabetes (control group). The age, parity, gestational age, and BMI of the study group were recorded and the patients were divided into 2 groups, i.e. those with regulated and unregulated glucose levels, according to their postprandial 1st- and 2nd-hour glucose values. A standardized skin surface biopsy method was used to determine if patients had *Demodex folliculorum* infestation (>5 mites/cm\(^2\) of skin). **Results:** Patients with gestational diabetes had a statistically significantly higher *Demodex* density compared to the control group (24.2 vs. 3.3%; \(p < 0.001\)). Furthermore, a significantly higher proportion of gestational diabetes patients with unregulated glucose levels had a higher *Demodex* density compared to those in the regulated subgroup (6/19 vs. 2/14; \(p = 0.001\)). **Conclusion:** Our study revealed that the *Demodex* density was increased in gestational diabetes patients. Further, poor glucose regulation could be the mechanism responsible for the increased *Demodex* density in gestational diabetes patients with unregulated glucose levels compared to those with regulated glucose levels.

**Introduction**

*Demodex folliculorum* and *D. brevis* are presumed saprophytic parasites living in the pilosebaceous glands and hair follicles of humans [1]. *D. folliculorum* can be found anywhere in the body where there are hair follicles, but it is particularly located in the cheeks, eyelids, nose, forehead, and chin, which are rich in sebaceous glands [2]. Although it is colonized in many individuals, it does not have clinical symptoms. Therefore, some do not regard this parasite as a pathogen. The density of the parasite had been shown to be <5 parasites/cm\(^2\) in asymptomatic individuals [3]. However, an increased *Demodex* density in skin disorders such as rosacea and blepharitis suggests that this parasite may be a pathogen. Furthermore, the *Demodex* density had been reported to be high in immunosuppressive conditions such as leukemia, HIV(+), and cancer [4–6]. It has also been shown that the *Demodex* density does not change in pregnancy [7].
Gestational diabetes, seen in 6–7% of pregnancies, is a carbohydrate intolerance which starts or is recognized in pregnancy [8]. Gestational diabetes increases the risk of preeclampsia, macrosomia, and cesarean section in pregnancy. Furthermore, 50% of women with gestational diabetes become diabetic in 22–28 years [9].

Studies have shown an increased incidence of *D. folliculorum* in diabetic patients [10, 11]. There is as yet no study investigating the *Demodex* parasite in gestational diabetes. Therefore, the aim of this study was to investigate the presence of *Demodex* in patients with gestational diabetes and the impact of glucose regulation on *Demodex* density in gestational diabetes.

**Subjects and Methods**

Thirty-three patients with gestational diabetes and 30 pregnant women without gestational diabetes (control group) attending the Obstetrics and Gynecology Outpatient Clinic of Mustafa Kemal University Hospital for pregnancy control from August 2013 to November 2013 were included in this study. The patients’ age, gestational age, parity, and BMI were recorded. The BMI was calculated as weight in kilograms divided by the square of the height in meters. At 24–28 weeks of gestational age, all pregnant women underwent an initial screening with a 1-hour 50-gram glucose challenge test. Subjects with a normal glucose tolerance test were considered the control group. If a patient’s glucose was higher than the Carpenter and Coustan criteria’s cut-off level, they underwent an initial threshold of 130 mg/dl, a 3-hour 100-gram glucose tolerance test was performed after an 8- to 12-hour fasting period. Gestational diabetes was diagnosed if 2 out of 4 blood glucose measurements were higher than the threshold. The mean age of the patients with gestational diabetes was 29.4 ± 5.6 years (range 20–35); the difference in age was not statistically significant (p = 0.30). The mean BMI values of the gestational diabetes and control groups were similar (28 ± 4.4 and 27 ± 3.1; p = 0.56).

**Results**

The mean age of the patients with gestational diabetes was 29.4 ± 5.6 years (range 18–36) and that of the control group was 30.3 ± 3.2 years (range 20–35); the difference in age was not statistically significant (p = 0.30). The mean BMI values of the gestational diabetes and control groups were similar (28 ± 4.4 and 27 ± 3.1; p = 0.32). The mean gestational age was similar in both groups (28.5 ± 2.1 and 30.2 ± 2.1 weeks). Nineteen patients with gestational diabetes had unregulated glucose levels, and 14 had regulated blood glucose levels. *Demodex* was noted in the skin biopsies of 8 patients with gestational diabetes.
sebaceous secretion is abundant. Because nose, forehead, external ear, and hair follicles of the eyes, blepharitis were excluded in the present study. Since papulopustular rosacea, granular rosacea, and tation might have been related to a poor glucose metabo-
lism. Karincaoglu et al. [18] found the density below 5 mites/cm² in the skin, with a density of 5 mites/cm² as normal skin flora. Their number increases in puberty with the activation of sebaceous glands. D. folliculorum are found more commonly in the face, cheeks, nose, forehead, external ear, and hair follicles of the eyes, where sebaceous secretion is abundant. Because Demodex mites are found in the skin following birth, they are considered normal skin flora. Their number increases in puberty with the activation of sebaceous glands. D. folliculorum can be seen in 20–80% of humans in normal skin, with a density below 5 mites/cm² [15–17]. For that reason, in the present study we accepted densities above 5 mites/cm² as Demodex infestation. Our study results were concordant with other research in diabetic populations. Karincaoglu et al. [18] found the Demodex density to be greater in patients with end-stage renal failure and greatest (44%) in those with renal failure related to dia-betes mellitus. Although the immune system is impaired in chronic renal failure, a higher incidence of Demodex in chronic diabetic renal failure suggests that diabetes itself and an impaired glucose tolerance might influence the Demodex density. Similarly, in our study, the Demodex incidence was increased in gestational diabetes without immune suppression. Akdeniz et al. [19] compared skin samples obtained from diabetics and healthy individuals and found an increased Demodex density and volume in diabetics. Clifford and Fulk [20] examined the eyelashes of 256 individuals and reported Demodex with a higher incidence in elderly and diabetic patients [20]. Our study results revealed for the first time in the literature that patients with gestational diabetes had increased Demodex infestation in their eyelashes.

The prevalence of Demodex mites has been reported to increase with age [21]. Regarding age, no significant differences were found between the groups in the present study. There is no consensus about whether or not Demodex is pathogenous. As Demodex does not produce infes-
tation in many hosts, some authors consider Demodex an opportunistic agent [21]. The presence of Demodex in immuno-suppressed conditions such as chronic renal disease, cancers, and malnutrition suggests that it can be an opportunistic pathogen [6, 22, 23]. On the contrary, Demodex densities were similar in a study comparing immunocompromised patients with a control group, and it was stated that Demodex could not be an opportunistic pathogen [24].

Although Aydingoz et al. [7] reported that the Demodex incidence did not increase in pregnancy, we found an increased Demodex incidence of 24.4% in gestational diabetics similar to the 24% reported by Gokce et al. [11]. Since gestational diabetes is not a chronic disease and has no direct effect on the immune system, the high Demodex incidence in our study may have arisen from an im-
paired glucose metabolism, as is the case with high glu-

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<th>Table 2. Subgroup analysis of gestational diabetic pregnancies according to glucose regulation</th>
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<td>Good glucose control (n = 14)</td>
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<td>Mean fasting glucose ± SD, mg/dl</td>
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<td>Mean 1st-hour postprandial glucose ± SD, mg/dl</td>
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<td>Mean 2nd-hour postprandial glucose ± SD, mg/dl</td>
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<td>Participants with an increased Demodex density, n</td>
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(24.2%) and only in 1 patient (3.3%) in the control group, which was statistically significant (p < 0.001) (table 1). Demodex was seen more in the eyelashes of patients with gestational diabetes compared to the control group (27.2 vs. 3.3%; p < 0.001). The Demodex frequency in eyelash follicles was significantly higher in patients with gesta-
tional diabetes compared to the control group (27.2 vs. 3.3%; p < 0.001). When a subgroup analysis was carried out in gestational diabetes, the results revealed that the Demodex density was higher in patients with unregulated glucose levels (6/19 vs. 2/14; p = 0.001) (table 2).

Discussion

The results of this study revealed an increased Demodex density in gestational diabetes. Moreover, the Demodex density increased in gestational diabetic patients with unregulated glucose levels compared to those with regulated glucose levels. Hence, the increased Demodex infes-
tation might have been related to a poor glucose metabol-
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Gestational Diabetes and D. folliculorum
cose levels in gestational diabetic patients with unregulated glucose levels compared to controls with regulated glucose levels.

The major limitation of this study was the relatively low patient number. Another limitation is the absence of a repeat oral glucose tolerance test in the 8th postpartum month in gestational diabetes patients.

Conclusion

The results showed an increased *Demodex* density in pregnant women with gestational diabetes. Furthermore, in patients with gestational diabetes with unregulated glucose levels the *Demodex* density was found to be higher than in patients with regulated glucose levels.

References