ORIGINAL ARTICLE

Frequency of Undiagnosed Depression and its Severity among Alopecia Areata Patients: A Cross-Sectional Study from a Dermatology Clinic in Karachi

Marium Akhtar[1*], Qurut ul Ann Zafar[1] and Washdev Amar[1]

[1]*Dr. A.Q. Khan Institute of Behavioral Sciences, Dow University of Health Sciences, Karachi, Pakistan*

Abstract

Background: Patients with Alopecia areata (AA) have a greater proportion of depressive symptoms than the general population, but the degree of association depends on age, sex, disease severity, and cultural setting, and limited literature is available in Pakistan regarding AA depression burden.

Objective: To determine the frequency of undiagnosed depression and its severity among alopecia areata patients visiting dermatology clinics.

Methods: The cross-sectional study was conducted in a dermatology outpatient clinic at Dow University Hospital of Health Sciences, Ojha Campus, Karachi, from December 2022 to May 2023, enrolling a total of 177 patients. The Beck Depression Inventory was used to assess depression, which was classified as minimal (0- 13), mild (14-19), moderate (20-28), and severe (29-63).

Results: The mean age was 32.1±9.07 years. Most patients were male (61.6%). Only 14.1% patients were found to have depression. Out of 25 patients with depression, the frequency of mild, moderate, and severe depression was 24%, 28%, and 16%, respectively. The frequency of depression showed a linear trend with increasing disease duration, with significantly higher depression in those with disease duration >10 years ($p<0.001$). Patients with facial area involvement had a higher likelihood of depression than those with scalp and body involvement ($p=0.007$). Depression frequency was seen to be higher in patients having a family history of AA ($p=0.007$) and depression ($p<0.001$).

Conclusion: The findings suggest that depression was frequently seen in alopecia areata patients and seems to be more dependent on clinical and family factors than sociodemographic aspects. The results highlight the value of regular psychological evaluation and specific mental health care in the treatment of AA.

Keywords: *Alopecia areata, dermatology clinic, depression, mental health, psychological burden, Pakistan.*

INTRODUCTION

Alopecia areata (AA) is a chronic dermatological disorder that presents when T-cell-mediated immune attack targets anagen hair follicles, resulting in bald patches in a small area or at numerous sites, such as the head, face, and skin. It is a worldwide disorder affecting about 2 percent of the population [1, 2]. It has three variations: patchy AA, total AA, and universal AA; most cases have been observed in individuals under 30 years of age [3]. Though AA does not expose the individual to the risk of death, the ambiguity of responding to a relapsing-remitting course and inability to forecast prognosis and response are highly distressing emotionally and result in worse quality of life [4, 5].

Sy *et al.* found in a large population-based study of the United States of America that the point prevalence of AA was 0.21%, and among the racial and ethnic groups, Asian, Black, and Hispanic individuals had higher prevalence rates than white individuals. The cases of alopecia totalis (2%) and alopecia universalis (3%) were also rare, but clinically important and revealed race and ethnic differences in the disease burden [6]. AA in some countries, like Pakistan, is related to significant psychosocial consequences. A cross-sectional investigation at Faisalabad indicated that patients lacked sufficient knowledge of the disease and faced social difficulties, which are indicative of poor misconceptions and stigma [7]. Another local study established the existence of high rates of appearance anxiety and loneliness in patients, mediated through sensitivity to rejection by others, with the apparent emotional and social burden of visible hair loss in the Pakistani sociocultural context [8].

One of the most commonly reported psychiatric comorbidities in patients with AA is depression, which is characterized by consistent poor mood, anhedonia, cognitive disturbances, and functional deficiency [9]. As observed internationally, people with AA have an increased rate of depressive symptoms, which appear to be larger depending on age, gender, the severity of the disease, and the cultural context [10]. Stronger relationships have been found between younger people and females across several Asian cohorts, indicating that the stage of development and gender-specific sociocultural anticipations could be sources of psychological susceptibility [11]. According to national data compiled in Pakistan, the development of AA at

*Corresponding author: Marium Akhtar, Dr. A.Q. Khan Institute of Behavioral Sciences, Dow University of Health Sciences, Karachi, Pakistan, Email: mariumakhter03@gmail.com
Received: December 30, 2025; Revised: May 18, 2026; Accepted: June 08, 2026
DOI: https://doi.org/10.37184/lnjpc.2707-3521.8.63

  ISSN: 2708-9134 (Online) Liaquat National Journal of Primary Care 2026; 8(3): 316-321

an early age is strongly linked with low self-esteem, regardless of gender. Moreover, a study of 84 patients with alopecia (mostly AA) conducted in Karachi in 2023 found that 53.6% of participants had an abnormal score on the depression scale, with higher levels of anxiety (52.4%) and low self-esteem (48.8%) [12]. These findings highlight the high mental health burden in local clinical groups.

Although AA is a problem receiving increased global interest due to its psychological impact, there is a gap in further investigations into it in South Asia, and these studies are diverse in their approaches (*i.e.*, evaluation tools, sampling approaches, and definitions of their findings), rendering comparisons challenging. The dermatology case services provided in Karachi, a large urban city with a high number of patients visiting dermatology clinics, focus on managing the clinical symptoms of cutaneous disease without treating depression or formally referring patients to a psychiatrist as part of dermatological practice. This deficiency of solid, in-office estimations of the frequency of depression among patients with AA influences the capacity of researchers to carry out studies to enhance comprehension of the problems faced by such patients in the framework of comprehensive patient care and affords researchers an absence of evidence to adopt the development of clinical multidisciplinary therapy plan; have the capacity to detect at-risk patients earlier; institute treatment plans that ignite both psychological and dermatological concerns. Thus, we planned this study intending to determine the frequency of undiagnosed depression and its severity among alopecia areata patients visiting dermatology clinics.

METHODS

The study used a cross-sectional design and was conducted at a dermatology outpatient clinic at Dow University Hospital of Health Sciences, Ojha Campus, Karachi. The study duration was December 2022 to May 2023. This study was commenced with the approval of the Institutional Ethical Committee (Ref#IBS/CM/MA/2023#6229). Adult patients aged 18 years and older, of both sexes, who visited a dermatology clinic with a known history of AA were included. The study excluded patients who already used antidepressant drugs and/or had made any psychiatric or mental diagnosis. Patients who were on dermatological drugs that had the potential to cause depressive symptoms were also disqualified. Moreover, pregnant and lactating females were not allowed to participate. Individuals who came to dermatology clinics solely for aesthetic or cosmetic reasons were not included in the study.

The study included 177 patients in the sample, calculated using the online calculator Open-Epi, based on the 13.2% prevalence of depression in AA [13] at a 95% confidence level and a 5% margin of error. The study participants were enrolled using a non-probability consecutive sampling method.

The Beck Depression Inventory (BDI), which is a self-reported measure (21 items), was used to determine depression among patients. It has been validated and was developed by Beck *et al.* [14] to assess the severity of depressive symptoms. A rating of 0 to 3 on each item yields a total score of 0 to 63, with higher scores indicating greater symptom severity. There were standard cut-off scores that were used to classify the level of depression as minimal (0- 13), mild (14-19), moderate (20-28), and severe (29-63) depression. The questionnaire was initially translated from English into the native language by an independent bilingual expert and subsequently back-translated into English by another bilingual translator to ensure conceptual consistency and accuracy.

The study team contacted eligible patients after standard outpatient dermatology visits, and a full description of the research purpose and procedures was provided to them. Participants who agreed to take part in the study were invited to a structured, face-to-face interview conducted in a confidential, comfortable setting. The demographic data, medical history, and clinical variables were documented systematically during the interview; the standardized BDI instrument was also used to assess depression status. The answers from every patient were recorded properly, and necessary information was collected from medical records to supplement the interview results.

SPSS version 27 was used to conduct statistical analysis of the data. Categorical variables were summarized using frequencies and percentages, whereas means ± standard deviations were used to summarize numerical variables. Frequencies of features of patients with depression status (yes/no) were compared using the chi-square test. P-value <0.05 and lower was considered to be statistically significant. Findings were given in tabular and graphical formats.

RESULTS

Mean ± SD of age was 32.1±9.07 years. Most of the patients were males (61.6%), married (43.5%), and living in urban areas (74.0%). Nearly one-third have received education up to graduation (34.5%), are employed (37.3%), and have a family monthly income between Rs. 25,000 and 50,000 (32.2%). The scalp side was found in 52% of patients, the face side in 19.2%, and the body side in 28.8%. Family history of AA was seen 36.2% patients (**Table 1**).

Table 1: Summary of patients' features.

Variables	Frequency	Percentage
Gender		
Male	109	61.6
Female	68	38.4

Variables	Frequency	Percentage
Marital status		
Single	59	33.3
Married	77	43.5
Divorced	19	10.7
Separated	22	12.4
Residence		
Urban	131	74.0
Rural	46	26.0
Educational status		
Uneducated	9	5.1
Primary	16	9.0
Middle	15	8.5
Matriculation	23	13.0
Intermediate	46	26.0
Graduate	61	34.5
Postgraduate	7	4.0
Occupational status		
Employed	66	37.3
Unemployed	52	29.4
Housewife	18	10.2
Student	41	23.2
Monthly income		
10,000 – 15,000 PKR	24	13.6
15,000 – 25,000 PKR	37	20.9
25,000 – 50,000 PKR	57	32.2
50,000 – 100,000 PKR	48	27.1
>100,000 PKR	11	6.2
Disease duration		
1 – 6 months	37	20.9
6 – 12 months	43	24.3
1 – 5 years	81	45.8
5 – 10 years	10	5.6
>10 years	6	3.4
Area involved		
Scalp	92	52.0
Face	34	19.2
Body	51	28.8
Family history of alopecia areata		
yes	64	36.2
no	113	63.8
Family history of depression		
yes	49	27.7
no	128	72.3

A total of 25 (14.1%) patients reported depression. Severity of depression suffered minimal depression in 6 (24%) patients, mild depression in 8 (32%), moderate depression in 7 (28%), and severe depression in 4 (16%) patients.

There was no significant difference in depression prevalence by age (p=0.533), gender (p=0.132), marital status (p=0.081), residence (p=0.807), education (p=0.964), occupation (p=0.135), or monthly income (p=0.278). The frequency of depression showed a linear increase across the period of increasing disease duration (p<0.001). Depression likelihood significantly varied based on area of involvement (p=0.004), family history of AA (p=0.007), and family history of depression (p<0.001) (**Table 2**).

Table 2: Comparison of patients' features among those with and without depression.

Variables	Depression		p-value
	Yes n(%)	No n(%)	
Age groups			
18-30 years	10(12.3)	71(87.7)	0.533
>30 years	15(15.6)	81(84.4)	
Gender			
Male	12(11)	97(89)	0.132
Female	13(19.1)	55(80.9)	
Marital status			
Single	6(10.2)	53(89.8)	0.081
Married	10(13)	67(87)	
Divorced	2(10.5)	17(89.5)	
Separated	7(31.8)	15(68.2)	
Residence			
Urban	19(14.5)	112(85.5)	0.807
Rural	6(13)	40(87)	
Educational status			
Uneducated	1(11.1)	8(88.9)	0.964
Primary	2(12.5)	14(87.5)	
Middle	2(13.3)	13(86.7)	
Matriculation	3(13)	20(87)	
Intermediate	7(15.2)	39(84.8)	
Graduate	8(13.1)	53(86.9)	
Postgraduate	2(28.6)	5(71.4)	
Occupational status			
Employed	6(9.1)	60(90.9)	0.135
Unemployed	12(23.1)	40(76.9)	
Housewife	3(16.7)	15(83.3)	
Student	4(9.8)	37(90.2)	
Monthly income			
10,000 – 15,000 PKR	3(12.5)	21(87.5)	0.278
15,000 – 25,000 PKR	5(13.5)	32(86.5)	
25,000 – 50,000 PKR	8(14)	49(86)	
50,000 – 100,000 PKR	5(10.4)	43(89.6)	
>100,000 PKR	4(36.4)	7(63.6)	
Disease duration			
1 – 6 months	2(5.4)	35(94.6)	*<0.001
6 – 12 months	4(9.3)	39(90.7)	
1 – 5 years	7(8.6)	74(91.4)	
5 – 10 years	5(50)	5(50)	
>10 years	5(83.3)	1(16.7)	
Area involved			
Scalp	13(14.1)	79(85.9)	*0.004
Face	10(29.4)	24(70.6)	
Body	2(3.9)	49(96.1)	
Family history of alopecia areata			
yes	15(23.4)	49(76.6)	*0.007
no	10(8.8)	103(91.2)	
Family history of depression			
yes	16(32.7)	33(67.3)	*<0.001
no	9(7)	119(93)	

*Significant at p<0.05

DISCUSSION

The current case study reported the prevalence of depression in patients having AA as 14.1%, with 24% having minimal symptoms, 32% mild, 28% moderate, and 16% severe depression. This is lower than what has been reported in some of the regional and international studies. As an example, a Pakistani clinical study showed that over half of patients with AA had abnormal depression scores on HADS [12]. In the same vein, Ghalamkarpour *et al.* [15] concluded that the mean HADS depression score was 8.24±5.20, which is indicative of mild depression, and a multicenter Chinese study signaled that the prevalence of depression was 40.3% [16]. Rates were even higher in Nepal, where Marahatta *et al.* [17] reported depression in 66.7% of the patients using the BDI tool, although the majority had a mild category. The prevalence was also 30.2% and 36.3% in studies conducted in Turkey [18] and India [19], respectively.

In a large study of primary care in the UK, Macbeth *et al.* [20] showed that the prevalence of depressive episodes was higher in those with AA (19.4%) than in the rest of the population. Conversely, a meta-analysis conducted by Lauron *et al.* [10] estimated the pooled prevalence of depressive disorders to be 9%, with a high level of methodological heterogeneity between studies. However, a study in Iran [21] discovered no significant difference in stress levels of AA patients and controls, which indicates that the psychological impact might be different in different populations.

Our study established a smaller prevalence of depression compared to the previous reports. This could be attributed to our stringent exclusion criteria, especially the elimination of patients with pre-existing mental disorders or on antidepressants. By reducing these confounding factors, our results are probably a better estimate of the depression acquired by AA in specific.

There was no statistically significant difference in the prevalence of depression among various age groups in the present study. This implies that the psychological effects of AA can be relatively the same across age groups. Even though it has been argued that some studies indicate that younger patients can be more psychosocially distressed because of the fear of being seen and not being accepted by society, there are varying results. For example, the meta-analysis by Lauron *et al.* [10] noted substantial heterogeneity in the depictions of depression across age groups without identifying any common age-specific pattern. On the same note, Macbeth *et al.* [20] found the general burden of depressive events to be higher in AA; however, age was not an independent determinant. These results confirm our observation that depression in AA may not be different according to age.

The prevalence of depression among male and female patients with AA was not statistically significantly different in our study. This implies that, among our cohort, the probability of depressive symptoms was not dependent on gender. Nevertheless, some of the international studies have reported gender-based disparities. In a meta-analysis involving a huge sample of countries (n=649), it was observed that AA and depression had positive, significant correlations in females younger than 55 years of age in China, India, and Brazil, but never found such relationships in males of various ages and nationalities [11]. Moreover, the UK population-based study by Macbeth *et al.* [20] showed that there is a total increased burden of depressive episodes in AA but indicated differences in demographic subpopulations.

In our research, the marital status, the place of residence, and the occupational status did not substantially relate to depression in patients with AA. The frequency of depressive symptoms was not different between married and unmarried people, urban and rural people, and various occupational groups. The findings of this study indicate that sociodemographic factors were not independent predictors of depression risk in our cohort. Despite this, although a few studies have hypothesized that unemployment, social isolation, or lack of social support may contribute to the worsening of psychological distress in dermatological conditions, evidence in AA remains inconsistent. A meta-analysis by Lauron *et al.* [10] indicated variability in the methods used across studies and heterogeneity in the demographics of different studies, which may explain the differing findings on sociodemographic determinants.

Our results suggest that the psychological weight of AA is more closely related to disease-related aspects than to sociodemographic traits. Some of the clinical characteristics of depression had a significant relationship in our cohort. The longer the period of disease, the higher the burden of depression. In the same way, the region affected the prevalence of depression, with facial involvement (29.4%) higher than scalp involvement (14.1%) and body involvement (3.9%). It was also found that family history of AA (23.4% *vs.* 8.8%) and family history of depression (32.7% *vs.* 7.0%) were significant. These findings are generally in line with the existing literature. Ghalamkarpour *et al.* [15] observed that the patients of AA with a greater degree of involvement or a longer duration of disease were more likely to submit a higher score in HADS on depression. Likewise, Marahatta *et al.* [17] established an association between disease chronicity and severity and higher BDI scores. A meta-analysis by Lauron *et al.* [10] also pointed out that clinical heterogeneity, such as lesion extent, duration, and family history, affected variability in the prevalence of depression across studies. On the whole, these findings support the idea that clinical and familial factors have a significant impact on the psychological effects of AA, rather than sociodemographic variables.

Several limitations of this study must be taken into account when interpreting the results. First, it was a cross-sectional design and can only be used to assess associations and not to determine causal relationships between depression and alopecia areata. Second, the study was conducted at a single center in Karachi, which may limit the generalizability of the results to other groups or geographic locations. Third, the use of self-reported questionnaires like BDI can also lead to reporting bias, and it might not be able to reflect the presence of clinical diagnoses of depression that have been confirmed through psychiatric assessment. Moreover, the study's statistical power might be limited by the relatively small sample size, which may make it difficult to detect less significant differences across subgroups, including age, gender, or sociodemographic characteristics. Lastly, we have not evaluated other possible confounding factors like coping strategies, social support, and comorbid chronic diseases, which might affect psychological outcome in AA.

CONCLUSION

The current paper shows that depression is a major comorbidity among patients with alopecia areata, with higher prevalence rates seen with longer history of the disease, facial involvement, and positive family history of AA or depression. The sociodemographic variables that included age, gender, marital status, residence, and occupational status did not have a significant difference between patients with and without depression. This information indicates that clinical and familial factors are the main determinants of the psychological burden of AA, rather than underlying demographic factors. Prior identification and specific mental health treatment of patients with a high-risk clinical profile could be used to alleviate the psychosocial burden of the condition.

ETHICS APPROVAL

This study was commenced with the approval of the Institutional Ethical Committee (Ref#IBS/CM/MA/2023#6229). All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and the Declaration of Helsinki.

CONSENT FOR PUBLICATION

Written informed consent was sought from all patients before their participation.

AVAILABILITY OF DATA

All of the data is presented within the manuscript. The raw data can be obtained from the corresponding author upon valid justification *via* email.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

Declared none.

AUTHORS' CONTRIBUTION

MA proposed the study, prepared the protocol, and drafted the manuscript. QUA collected the data, analyzed the results, and drafted the manuscript. WA critically reviewed and revised the initial draft of the manuscript. All authors read and approved the manuscript.

REFERENCES

1. Ma T, Zhang T, Miao F, Liu J, Zhu Q, Chen Z, Tai Z, He Z. Alopecia areata: pathogenesis, diagnosis, and therapies. MedComm (2020) 2025; 6(5): e70182. DOI: https://doi.org/10.1002/mco2.70182
2. Villasante Fricke AC, Miteva M. Epidemiology and burden of alopecia areata: a systematic review. Clin Cosmet Investig Dermatol 2015; 8: 397-403. DOI: https://doi.org/10.2147/CCID.S53985
3. Sibbald C. Alopecia areata: an updated review for 2023. J Cutan Med Surg 2023; 27(3): 241-59. DOI: https://doi.org/10.1177/12034754231168839
4. Gandhi K, Shy ME, Ray M, Fridman M, Vaghela S, Mostaghimi A. The association of alopecia areata-related emotional symptoms with work productivity and daily activity among patients with alopecia areata. Dermatol Ther (Heidelb) 2023; 13(1): 285-98. DOI: https://doi.org/10.1007/s13555-022-00864-1
5. Mesinkovska N, Craiglow B, Ball SG, Morrow P, Smith SG, Pierce E, *et al.* The invisible impact of a visible disease: psychosocial impact of alopecia areata. Dermatol Ther (Heidelb) 2023; 13(7): 1503-15. DOI: https://doi.org/10.1007/s13555-023-00941-z
6. Sy N, Mastacouris N, Strunk A, Garg A. Overall and racial and ethnic subgroup prevalences of alopecia areata, alopecia totalis, and alopecia universalis. JAMA Dermatol 2023; 159(4): 419-23. DOI: https://doi.org/10.1001/jamadermatol.2023.0016
7. Maan MA, Hussain F, Abrar A, Zahoor H, Akhtar SJ. Knowledge, beliefs and perceptions among alopecia areata patients: a cross-sectional study in Faisalabad. J Pak Assoc Dermatol 2021; 31(1): 51-7. DOI: https://doi.org/10.66344/jpad.31.1.2021.1525
8. Rehman S, Jameel R. Appearance anxiety and loneliness: the mediating role of rejection sensitivity in patients with alopecia areata in Lahore, Pakistan. J Pak Med Assoc 2023; 73(4): 800-3. DOI: https://doi.org/10.47391/JPMA.6302
9. Mostaghimi A, Soliman AM, Li C, Barqawi YK, Grada A. Immune-mediated and psychiatric comorbidities among patients newly diagnosed with alopecia areata. JAMA Dermatol 2024; 160(9): 945-52. DOI: https://doi.org/10.1001/jamadermatol.2024.2404
10. Lauron S, Plasse C, Vaysset M, Pereira B, D'Incan M, Rondepierre F, *et al.* Prevalence and odds of depressive and anxiety disorders and symptoms in children and adults with alopecia areata: a systematic review and meta-analysis. JAMA Dermatol 2023; 159(3): 281-8. DOI: https://doi.org/10.1001/jamadermatol.2022.6085
11. Gupta AK, Economopoulos V, Talukder M. Examining the relationship between alopecia areata and mental health: an investigation of the Global Burden of Disease Study 2021. J Cosmet Dermatol 2025; 24(7): e70325. DOI: https://doi.org/10.1111/jocd.70325
12. Ara G, Tunio W, Khan NI, Tariq A, Jamshed T. Anxiety, depression, and low self-esteem among people with alopecia. Khyber Med Univ J 2023; 15(3): 161-6. DOI: https://doi.org/10.35845/kmuj.2023.22653

13. Jagtiani A, Nishal P, Jangid P, Sethi S, Dayal S, Kapoor A. Depression and suicidal ideation in patients with acne, psoriasis, and alopecia areata. J Ment Health Hum Behav 2017; 22(1): 50-4. DOI: https://doi.org/10.4103/0971-8990.210700

14. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry 1961; 4: 561-71. DOI: https://doi.org/10.1001/archpsyc.1961.01710120031004

15. Ghalamkarpour F, Araghi F, Tabari M, Moslemi Haghighi S, Pourgholi E. Comparing quality of life, anxiety, depression, sleep disturbance, and associated factors in vitiligo and alopecia areata patients. J Cosmet Dermatol 2024; 23(5): 1808-15. DOI: https://doi.org/10.1111/jocd.16158

16. Li X, Du X, Zhao H, Wang Y, Pi L, Luo Y, *et al.* Patient-reported psychosocial impact of alopecia areata: a multicenter cross-sectional study. J Am Acad Dermatol 2025; 93(5): 1294-6. DOI: https://doi.org/10.1016/j.jaad.2025.07.001

17. Marahatta S, Agrawal S, Adhikari BR. Psychological impact of alopecia areata. Dermatol Res Pract 2020; 2020: 8879343. DOI: https://doi.org/10.1155/2020/8879343

18. Yildiz H, Zincir S. Anxiety and depression in patients with alopecia areata in Eskisehir, Turkey. Clin Cosmet Investig Dermatol 2023; 2023: 2443-50. DOI: https://doi.org/10.2147/CCID.S424374

19. Sengupta S, Ghosh A, De P, Ghosh PK, Nandi S. A hospital based cross-sectional study measuring the psychological comorbidities associated with alopecia areata in Indian patients. J Indian Med Assoc 2023; 121(11): 18-21.

20. Macbeth AE, Holmes S, Harries M, Chiu WS, Tziotzios C, de Lusignan S, *et al.* The associated burden of mental health conditions in alopecia areata: a population-based study in UK primary care. Br J Dermatol 2022; 187(1): 73-81. DOI: https://doi.org/10.1111/bjd.21055

21. Kiafar B, Sabeti V, Faridhoseini F, Jarahi L, Salamian S. Evaluation of personality traits of patients with alopecia areata according to a five-factor model. Iran J Dermatol 2022; 25(3): 204-9. DOI: https://doi.org/10.22034/IJD.2021.280785.1366