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The burden of alopecia areata: a scoping review focusing on quality of life, mental health and work productivity

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Abstract:

Alopecia areata (AA) is a common inflammatory autoimmune disease of the hair which can have a significant negative impact on the quality of life (QoL), mental health, and productivity. The aim of this scoping review is to elucidate the burden of AA focusing on these three realms. Inclusion criteria included all original manuscripts with no restriction on study type or statistical method written in English (or having an English abstract). For QoL 40 articles were included, 85 for psychiatric comorbidities, and 9 for work/school absenteeism/presenteeism mostly consisting of cross-sectional and observational cohort studies. QoL impairment was detected in over 75% of patients and up to one-third reported extremely severe QoL impairments. Specific QoL dimensions with the greatest impact were embarrassment, social functioning, as well as shopping and/or housework. Cross-sectional studies assessing the psychological burden of adult patients with AA found that the presence of signs of anxiety and/or depression ranged from 30-68% and affected all age groups. Rates of work absenteeism and unemployment were significantly higher in AA patients compared to healthy controls. Up to 62% reported making major life decisions including relationships, education and career based on their AA. Additionally, the extensive camouflage techniques and time lost from work led to a strong financial burden for patients and the numerous physician visits added to the healthcare costs. The overall impact of AA stretches much further than simply being an aesthetic concern and can negatively impact every part of an individual's life. An individualized approach and effective treatments will help reduce the psychosocial consequences and distress and return patients to their normal state of health.

Introduction

Alopecia areata (AA) is a common inflammatory autoimmune disease affecting ~ 2% of the population,[1] irrespective of sex, gender, ethnicity, and age.[2]

Although AA may involve any hair-bearing area, the scalp is the most commonly affected site.[3] Patchy (or localised) AA is seen in ~70% of cases.[3] Of these, only ~50% experience spontaneous regrowth within a year of disease onset. In most patients, the disease eventually recurs.[4] Approximately 15-25% of patients develop alopecia totalis (AT; complete scalp hair loss) or universalis (AU; complete body hair loss).[3] Additional less common AA patterns include diffuse (androgenetic alopecia-like), reticular (extensive confluent patches), ophiasis (band-like, peripheral pattern) and ophiasis inversus (sisaipho central pattern).[3] In extensive cases, ophiasis and ophiasis inversus, spontaneous regrowth is rare.[4] Nail disease (seen in ~30% of AA patients) concurs a worse prognosis.[5]

The Severity of Alopecia Tool (SALT) is widely used in clinical trials to measure the severity of AA by computing the extent of hair loss across the scalp (0-100%).[6] A SALT score >50% is typically defined as severe disease and is often an indication for systemic therapy.[4] Investigator Global Assessment (IGA) and Alopecia Areata Progression Index (AAPI) scores were also developed to quantify disease severity.[4] However, none of these tools is perfect as they focus ~~primarily~~ on the extent of scalp hair loss without accounting for additional clinical findings (*e.g.* pattern; duration; hair pull test; trichoscopy; facial/body hair loss; nail involvement), nor do they take the patient's perspective or quality of life (QoL) into account.[6] For some individuals, extensive disease may be tolerable, but for others, even limited disease may be devastating; hence including patients' perspectives into disease severity assessment is of utmost importance.[7,8]

AA management focuses on hair regrowth, camouflage of hair loss and psychological support.[4] To date, most traditional medical treatment options are of limited efficacy and often associated with a high risk of adverse events.[4] Newer medical therapies for hair regrowth are often inaccessible because of reimbursement issues and false perceptions of AA as merely cosmetic.[9] However, AA is associated with significant psychosocial distress that remains underestimated by laypersons, stakeholders and even treating physicians further worsening the psychosocial distress and disease burden as patient feelings are not recognized and the support is not provided.[9,10] The aim of this scoping review is to elucidate the burden of AA by specifically focusing on how AA impacts QoL, mental health and work/school productivity and to identify possible associated risk factors.

Methods

A comprehensive scoping review was performed to establish the burden of AA in affected individuals by specifically focusing on the impact of AA on QoL, mental health and work/school productivity. The PRISMA reporting guideline Extension for Scoping Reviews were followed.[11] We searched the literature using the PubMed and Embase databases for studies published from inception until June 22, 2022 using the following search terms: (alopecia areata) AND (quality of life); (alopecia areata) AND [(mental health) OR (psychiatric) OR (psychological) OR (depression) OR (anxiety) OR (psychosis) OR (personality disorder) OR (substance abuse) OR

(alcohol abuse) OR (suicide) OR (self-harm)]; (alopecia areata) AND [(sick leave) OR (change of job) OR (change of profession) OR (work-life) OR (insurance) OR (pension) OR (work productivity) OR (absenteeism) OR (presenteeism) OR (unemployment) OR (financ*) OR (economic*)] as either keywords or MeSH terms. Inclusion criteria included all original manuscripts with no restriction on study type or statistical method written in English (or having an English abstract). Studies were excluded if: they were review articles, case reports or case series, guidelines, protocols, and conference abstracts; they focused on hair loss conditions other than AA or did not report AA findings separately among other hair loss conditions; or they did not focus on the search terms. All publications were independently assessed by AM and SG first by screening titles, then abstracts, followed by full-length manuscripts; any discrepancies were discussed and resolved. Additional articles were manually searched from reference lists of identified articles and through the Related Article feature in PubMed. The remaining publications were analysed in detail, and the QoL instruments used in AA were listed. Additional PubMed searches were carried out for 'alopecia areata' and the name of each of the measures from this list.

Results

The search for QoL and AA revealed 392 articles, of which 104 remained after screening the titles. Of full-text manuscripts reviewed, 40 were included. The majority of the articles were cross-sectional surveys and observational studies with patient numbers ranging from 17 to 1,494 (Figure 1A, Table 1). The search for psychiatric comorbidities and AA revealed 774 articles, 85 articles remained after screening the titles and reviewing full-text manuscripts. Most studies were cross-sectional surveys and observational studies based on registries and/or administrative databases with patient numbers ranging from 3 to 2,298,432 (Figure 1B, Table 2). Work/school productivity search revealed 186 articles, of which 7 were included (Figure 1C). Two additional manuscripts were added from a manual search of references, for a total of 9 articles. The main study type was cross-sectional with patient numbers ranging from 45 to 5,435.

Quality of life

Over 20 different QoL tools were used across 40 studies, with the Dermatology Life Quality Index (DLQI), the Skindex-16, and the 36-Item Short Form Survey (SF-36) being the most common (Figure 2 and Table 1). In both adults and children, at least some impairments in QoL were detected in over 75% of patients and up to one-third reported extremely severe QoL impairments.[12–14] In comparison to other cutaneous conditions, such as androgenetic alopecia and psoriasis, QoL was significantly worse in AA.[15–17] In some cases, the impact was so significant that patients described the loss of self-identity as devastating and emotionally draining to the point that they could not look at themselves in the mirror.[18]

Worse QoL was more common in younger patients[19–24] and in women except in children where boys and older age of onset predicted poor QOL.[25] For both men and women, AA features associated with poor QoL included more severe and widespread involvement, longer lasting and recurrent disease, as well as hair loss affecting the eyebrows and eyelashes.[19–24] Of note, beyond self-image and stigmatization, the loss of eyebrows/eyelashes was associated with ocular

irritation/functional impairment whereas scalp hair loss with cold/heat sensitivity and increased risk of sunburns amplifying the effect on the QoL.[18] The effect of nail AA involvement on QoL appears less important, but data is scarse.[26] Additional comorbidities especially mental health worsened QoL. Successful treatment improved QoL.[27]

In a study using the Skindex-16, patients with <94% of scalp hair loss reported a greater QoL impact compared to patients with 95-100% loss with the highest burden being in the 21-49% range.[28] Similar results were seen in another work.[29] Authors suggested that this discrepancy might be explained by various factors including better coping strategies in AT/AU patients[28] and additional challenges of patchy hair loss such as camouflaging difficulties, under recognition/misdiagnosis and limited treatment access.

Further, a recent publication compared physician's and patient's assessment of disease severity and whether this correlated with QoL (Skindex-16).[23] A significant difference in scoring was noted (mean patient Hair Loss Severity score=3.25, SD=1.11 *vs.* mean SALT score=2.02, SD=1.31, $p<0.0001$). While both the physician's and the patient's scores generally correlated with QoL, the patient's rated severity was a better predictor of QoL.[30] Authors hypothesised that the negative impact of hair loss on patients' self-image worsened their perception of AA severity and subsequently their QoL. Prior studies supported the association between QoL and self-perception.[14,31,32] Figure 3 visually illustrates patients' stories and impact of AA on their QoL.

Despite significant heterogeneity among identified studies and QoL tools used, most severely affected QoL dimensions in adults and children included mental health and/or emotional domains, followed by functional domains (*e.g.* physical, social, familial functioning). Symptomatic domains were the least affected.[12,20] In a survey conducted in adult and pediatric AA patients, it was demonstrated that emotional distress not only affected AA patients, but similar to atopic dermatitis, also extended to family members (*e.g.* spouses and/or parents).[33] Parents of affected children suffered significantly as parental QoL was found to be even more affected than that of the affected child.[12] While, in general, patients mentioned that family members were supportive, they acted uncomfortable or shocked following the diagnosis of AA due to a lack of understanding of the condition, thereby emphasising the need to improve disease awareness in our society.[34,35]

Patients with AA struggled to develop new and to maintain existing romantic relationships.[36] Specifically, they were not comfortable discussing their diagnosis with new partners and feared being perceived as unattractive.[18] Both men and women reported feeling insecure regarding their appearance and experienced decreased sexual QoL, regardless of marital status, primarily due to embarrassment and anxiety related to their hair loss.[36–38] Up to one-third of individuals terminated their relationship due to AA.[18] Patients also reported feeling the need to camouflage their baldness at home because of concerns that the partner would find their appearance unattractive.[10] Similarly, friendships may also be challenged as AA patients disclosed frequent loss of friends due to lack of support and understanding.[34] This, in addition to self-stigmatization, led to social withdrawal, contributing to feelings of isolation, further worsening QoL and mental health.[18,34]

Psychiatric comorbidities

AA was associated with a significant mental health burden including anxiety, depression, suicidal ideation/behavior and higher rates of psychiatric hospitalizations.[39,40] Cross-sectional studies assessing the psychological burden of adult patients with AA estimated that 30-68% of patients presented mental health symptoms (usually anxiety and/or depression).[13,22,41–44] Diagnoses of anxiety and/or depression were more prevalent among patients with AA compared to age- and gender-matched controls ($p<0.0001$).[42,43,45–48]

While mood disorders often co-occurred with AA, recent studies found that receiving a diagnosis of AA served as a risk factor for the development of depression, rather than the inverse.[49] Following a diagnosis of AA, there was a 30–38% higher risk of subsequently being diagnosed with new-onset depression and similarly, being prescribed antidepressants compared to controls.[48,50] The risk was higher among female patients and those aged 30-49.[51]

Several surveys screened for symptoms of depression which were present in 18-100% of patients (Table 2) and were ~4-times more common compared to healthy controls (OR=4.48; 95%CI: 2.12-9.44).[47] Depending on the population studied, up to half (47.0%) of patients had extremely severe symptoms.[52] Data in children is scarce, however suggests rates as high as 6-50% [13], which are significantly higher than in the general pediatric population or in the healthy controls.[46,53] In general, severity scores for depressive symptoms worsened with increased AA severity (SALT score),[44] and improved with successful treatment.[54]

The risk of suicidality among patients with AA remains to be further assessed through large cohort and/or populational studies. However, while a 1998 study did not find an increase in suicidal ideation among patients with AA,[55] more recent studies determined that the risk of suicidal ideation might be as high as 13-38.5% and 4.3% may attempt suicide (no significant difference between women and men).[13,56]

Anxiety disorders were also common in patients with AA. The diagnosis of anxiety independently and positively correlated with AA (OR=1.22, 95% CI: 1.13–1.31 $p<0.001$) across all age groups above 30 years old, with similar rates in men and women.[51] Similar results were reproduced in other studies.[47,48,50,51] Patients with AA also had a higher rate of prescribed anxiolytics to manage anxiety compared to controls.[48]

Surveys demonstrated that anxiety symptoms were omnipresent among AA patients (up to 62%) especially in women[42] and were up to 3-fold higher that in controls.[47] In Rajoo *et al.*, all participants had symptoms of anxiety, and more than half (66.3%) reporting extremely severe anxiety.[52] Interestingly, a recent cross-sectional study found that anxiety scores were the highest for hair loss in a range from 25-49%, similar to findings in QoL studies.[22] Results of other studies exploring the association between anxiety scores and AA severity based on SALT score showed inconsistent results.[44,47] Pediatric patients with AA were not spared and the signs of anxiety were seen with higher prevalence compared to the general pediatric population and the healthy controls.[46,53] Separation anxiety, generalized anxiety, and social phobia scores were also higher than in controls.[46]

Social anxiety is common in AA patients and was reported to be clinically significant in 47.5%.[41] Social withdrawal was especially important early on during the disease process, specifically from social activities (62%) and interactions with friends (54%). Reported reasons included feelings of isolation, social rejection, and bullying. Attention deficit hyperactivity disorder (ADHD), obsessive-compulsive disorder (OCD), and other mood disorders were also found to be at higher rates among patients with AA compared to healthy controls.[57,58]

Stress, an emotional response caused by an external factor, is less well studied in the landscape of AA, however it may play an important role in disease relapse and disease relapse may further accentuate stress, while also provoking anxiety. In adult patients with AA, moderate stress[13] and was significantly higher among those with disease relapse compared to controls.[59] Main stressors identified were linked to emotional distress, social discomforts, demanding treatment protocols, unpredictable disease course, and experiencing discrimination due to hair loss.[35] In general, women experienced more stress due to AA, while patients with hair regrowth had a lower burden of stress.[35] In children, history of stressful events was also more common in AA patients compared to controls.[40,46]

In the elderly patients, AA increased the risk of developing dementia and was hypothesized to be related to poor social engagement - a known risk factor for dementia.[38] Patients with AA were more likely to develop any dementia (adjusted hazard ratio [aHR]=3.24; 95% CI, 2.14–4.90), Alzheimer's disease (aHR=4.34; 95% CI, 1.45–12.97), and unspecified dementia (aHR = 3.36; 95% CI, 2.06–5.48) than the control cohort.[38]

Work and occupation

All spheres of life can be affected in patients with AA including work/school productivity, personal life as well as finances. The risk of work absenteeism (56%) and unemployment (82%) was significantly higher in AA patients compared to healthy controls matched for age, sex, and socioeconomic status.[18,48] Reported prevalence of work repercussion ranged 40-60%.[18,34] This discrepancy may be due to a variety of factors, such as development of new-onset depression and anxiety after diagnosis,[48] social withdrawal/embarrassment due to visible hair loss[18,36] and/or increased scheduling of medical appointments (*e.g.* dermatologists, primary care physicians, psychologists and other).[18]

A recent study conducted in the US assessed work productivity in patients with AA with the Work Productivity and Activity Impairment (WPAI) score.[23] This validated assessment tool evaluates absenteeism (*i.e.* missing work), presenteeism (*i.e.* reduced functioning while at work) in both paid and unpaid work.[23] In patients with AA, absenteeism was associated with the presence of eye irritation from eyelash hair loss, and rhinorrhea and sneezing from nasal hair loss, while presenteeism was higher among women, those with AA involving eyebrow, eyelash, and/or nasal hair loss, those with AU, and those who perceived their disease to be moderate-to-severe.[23] AA severity (moderate-to-severe disease) was also associated with greater work impairment and higher rates of unemployment.[19,60] The mean percentage of time of decreased work productivity was estimated to be ~ 10% or 50 minutes per day, similar to the rate of 13% for interference of daily activities outside of work.[23]

Additionally, patients with AA experienced decreased confidence which interfered with their ability to obtain promotions or to find a job after unemployment.[18] AA not only affected the ability to function/attend work, but in fact, led to alteration of career/education plans and in the selection of positions with less public visibility.[10]

The daily lives of school children with AA were similarly disrupted. Half of affected children (51%) reported missing school and performing poorly (failing, having to repeat years, or stopping) due to distress associated with the hair loss.[18] Due to stigmatization, 25% and 3% of children experienced repetitive and constant bullying, respectively.[61] While children of all ages were bullied, boys and those with milder disease were at higher risk.[61] This led to reduced QoL, mental wellbeing and school attendance/performance. Children reported embarrassment, staying home from school at least once, performing poorly due to distraction and distress,[18,61] limiting their participation in scholarly and parascholar activities and formation of friendships and self-esteem.[36] It is therefore common for these patients to struggle with a restricted lifestyle, failing or discontinuing school, and to practice avoidance of sports and social events as they get older.[18,36]

Life Beyond Work/School

The impact of AA on a patient's well-being extends into making decisions about their life and future. In a survey of 216 patients aged 18 years and older, 62% reported making major life decisions including relationships, education and career due to AA.[18]

Patients often used extensive camouflage techniques to hide the effect of AA. These are extensive, time-consuming, and very costly.[62-64] Concealment strategies were used by 90% of women and 72% of men at first symptoms of hair loss.[18] In a survey assessment of patients with hair loss (82.6% had AA), wigs were used by 86.7% of patients to socialize and by 55.9% at all times.[41] Surveys administered to AA patients highlighted that the majority (75%) persistently covered up hair loss with the average time spent of 10.3 hours per week, increasing to 13.7 hours per week when the disease was at its worst, representing considerable time lost.[18]

While the use of wigs and hair pieces has been shown to reduce QoL/mental health burden, it came with numerous concerns of its own such as physical discomfort, cost, as well as risk/worry that the hairpiece/wig will fall off (39%) or be noticed by others (47%).[41] Camouflaging hair loss was also associated with reduced physical activity levels (41%) due to concerns that hairpiece/wig would become displaced and especially avoidance of swimming.[34] This lack of engagement in physical activity can have detrimental consequences of general physical/mental health and social interactions.[41] Avoidance of activities extends beyond exercise and involves shopping, socializing and even just going outside the house because of the anxiety that the hair loss would be noticed.[18] Although there were many identified downsides to the use of hairpieces/wigs, the majority of patients chose to use them to avoid the stigmatization.

Financial burden

As is the case for many chronic conditions, patients with AA experienced a higher burden of costs related to their disease compared to healthy controls. These included, but were not limited to, lost income, insurance premiums, deductibles, uninsured medications, transportation, medical

appointments, wigs and hair pieces and cosmetic products/procedures.[65] Work absenteeism translated to a significant financial burden, where >18% of patients in a survey-based study lost an annual median of $500 (interquartile range $200-2,250) secondary to missing work.[66] MarketScan claim analysis of AA patients revealed mean annual (standard deviation [SD]) healthcare costs of $11,241.21 USD ($43,839.69) for all causes and $419.12 USD ($1,534.99) for AA primarily accounting for outpatient visits and prescription medications.[67] The cost was much higher for patients with AT/AU when compared to matched controls ($18,988 USD versus $11,030 USD, respectively) as opposed to the non-AT/AU group when compared to matched controls ($13,686 USD versus $9,336 USD).[65]

Li *et al.* studied the out-of-pocket costs for patients with AA. The median annual spending was $1,354 USD (interquartile range, $537-3,300), with a large sum of these costs incurred for medical appointments and the purchase of vitamins/supplements.[66] The out-of-pocket costs were higher with AT/AU.[65] The majority of patients were seriously (25.2%) or moderately (31.7%) affected by the financial burden.[66] In addition, the annual cost of buying hair pieces/wigs and receiving psychotherapy to manage the hair loss averaged $2,000 USD per year.[18] Most (65.1%) patients worried about being unable to afford hairpieces/wigs.[41] Other studies concurred similar estimates of out-of-pocket costs, ranging from $500 USD to $3,300 USD per year[18,65,66] and reaching as high as $5,000 USD monthly, if off-label drugs were prescribed as they were not covered by insurance companies.[36]

To cover expenses incurred due to AA, 41.3% of patients accessed their savings, 36.7% cut down on expenses and activities, and 33.9% reduced their spending on basic needs such as food and clothing.[66] Although impacted by the financial burden of AA, in a willingness-to-pay analysis of 40 adult patients (aged 18 and older), it was found that individuals were willing to pay 12-20% of their monthly income for a permanent AA cure, with those experiencing severe disease willing to pay more.[68]

Discussion

Symbolism of hair and stigmatization associated with hair loss

Regardless of the continent, hair is among the most powerful symbols of individual and group identity. It is a part of our body and hence is very personal, and yet, it is also very public as the appearance of an individual's hair can send a "message" about their age, gender, ethnicity, culture, religion, social status, profession, emotional and/or health state and more.[69,70] The importance of hair in our society is well-illustrated by the hair care product industry amounting for $85.5 billion USD (2017) in addition to another $46.5 billion USD (2019) annually for hair salon treatments in the US alone.[71,72]

Hair can be altered in a variety of ways (*e.g.* length, colour, and/or style) and possibly, due to this versatility, possesses a unique power as a personal symbol of self.[73] The importance of hair in shaping one's identity is deep-seated from the earliest writings and myths where hair had the power to transform a nomad into a suitor, powerful to powerless, and nobility to peasantry.[74] Its value and power is taught from childhood through the bible (*e.g.* story of Samson [Judges, 16:15-17]) and celebrated in cartoons (*e.g.* Rapunzel). Similarly, unique hair symbolism is encountered

in almost every culture or religion (*e.g.* Hasidic Jewish, Sikh, Muslim and more). Dense, well-groomed hair is honored by the industry, media and public. It may even be associated with a better electability as only 5 elected US presidents experienced hair loss despite androgenetic alopecia affecting ~85% of older men.[75] Cutting or shaving scalp hair is a powerful statement often used in fundraising campaigns (*e.g.* Leucan).[76]

Considering the inherent importance and visibility of hair, individuals with hair disease are at risk of self and public stigmatization. A recent cross-sectional survey-based study objectively measured the prevalence and significance of public stigma towards patients with AA.[9] Most participants (>80%) did not know what AA was. Stigma was common and increased as the severity of hair loss worsened. Patients with the most severe hair loss were described as sick (29.8%), not attractive (27.2%), contagious (9.9%), unintelligent (3.9%), and even dirty (3.9%).[9] Individuals reported that they would not feel comfortable having physical contact with AA patients (16.9%) or hiring AA patients for a job (6.2%).[9] Of importance, when AA was recognized as a medical condition, the public stigma surrounding it decreased.[9]

In patients with AA, self-esteem and identity may be shattered, leading to feelings of loss, grief, confusion and shame.[9,10] Self-stigmatization is omnipresent and is even more common than among patients with mental health conditions.[77] It is very important to recognize the medical nature of AA (*i.e.* not merely aesthetic) to address the self and public stigma associated with hair loss and improve the outcomes of AA patients (*e.g.* improved QoL/mental health through holistic management approach including mental health support, research and development of new therapeutics and patients' advocacy).[36,61] While this does not address the stigmatization, interventions both in terms of medical treatments and supportive care (*i.e.* camouflage techniques) have shown to improve the QoL, mental health and well-being of AA patients.[78–80]

In this scoping review, we identified 40 original articles focusing on the impact of AA on QoL, 85 on the mental health burden and 9 on work/school/non-remunerated productivity. The available data indicates that QoL impairment is omnipresent and ~ a third of patients experience extremely severe QoL impairments.[12–14] Specific QoL dimensions with the greatest impact were emotional and functioning domains including physical and social functioning.[12] Women, younger patients and those with facial hair loss were identified as at higher risk of poor QoL.[19–24] QoL impairment spilled into familial, romantic and other relationships often affecting the entire social structure of the individual.[33] Several studies have shown that the disease extent as measured by SALT or other scores focusing solely on the extent of scalp hair loss does not always correlate with the burden experienced by the patient suggesting that patient's experiences must be taken into severity assessment.[23] Resolution or improvement of AA with treatment was correlated with improvement in health-related QoL.[27] Unfortunately, data on patient-reported outcome (PROs) measures such as health-related QoL is scarce among AA clinical trial programs. However, limited available data suggests trends in QoL improvement both in disease specific and generic QoL measures with active treatment.[27]

Symptoms of anxiety and/or depression ranged from 30-68% and affected all age groups.[43,52,56,57,81–87] Suicidal ideation and social anxiety were common, albeit additional studies are needed to confirm and further explore these latter findings.[13,23,56,58,88] In children, additional

common comorbidity identified was ADHD spectrum whereas higher risk of dementia was seen in the elderly.[38,40,57,89] While being a woman and having a worse disease severity increased the risk of mental health comorbidities, patients with less extensive scalp hair loss and/or facial hair loss were also at high risk and hence, should also be carefully screened for psychiatric comorbidities and managed appropriately.[23,28,90] Similarly to QoL, anxiety and depression scores were significantly reduced in patients receiving systemic treatment as opposed to placebo.[54] However, this data comes from only 1 identified trial and hence, including PROs in clinical trials design is of high importance in AA.

Two thirds of patients reported making major life decisions including relationships, education and career based on their AA. Almost every second AA patient regularly missed work or school due to their AA whether it was due to incident mental health disorders, embarrassment, frequent medical appointments and/or bullying (in children).[18,48,61] Compared to matched controls, AA patients were >80% more likely to be unemployed.[19,60] In adults, unemployment and absenteeism/presenteeism were associated with being a woman, having moderate-to-severe disease (as perceived by the patient) and facial hair loss.[23] In children, over half reported missing school and/or performing poorly.[18] Boys and those with patchy AA were at a higher risk of bullying, absenteeism and/or poor performance.[61] Of note, restricted lifestyle during childhood was associated with life-long repercussions.[18,36] AA also interfered with individuals' career choices and ability to obtain promotions.[10,18] Extensive and multifactorial financial burden has been documented in AA due to lost income, insurance premiums, deductibles, uninsured medications, transportation, medical appointments, camouflage techniques and more.[65] However, we did not identify any studies assessing the impact of successful treatment on work/school productivity or pharmaco-economics.

Limitations

We aimed to capture the multidimensional impact of AA on a patient's life; however, there are aspects which may have been missed or for which there is a lack of an objective measurement and, therefore, could not be accounted for in this review.

Conclusion

The overall impact of AA stretches much further than simply being an aesthetic concern. It can significantly negatively impact every part of an individual's quality of life including mental wellbeing, social/romantic relationships, familial unit, occupation, productivity, and finances. Hence, having an individualized approach, taking into account reported outcome measures such as QoL, should be strongly considered when caring for and making management decisions for AA patients. Effective treatments are required to help reduce the psychosocial consequences and distress and return patients to their normal state of health.

Ethics Statement: The patients in this manuscript have given written informed consent to publication of their case details.

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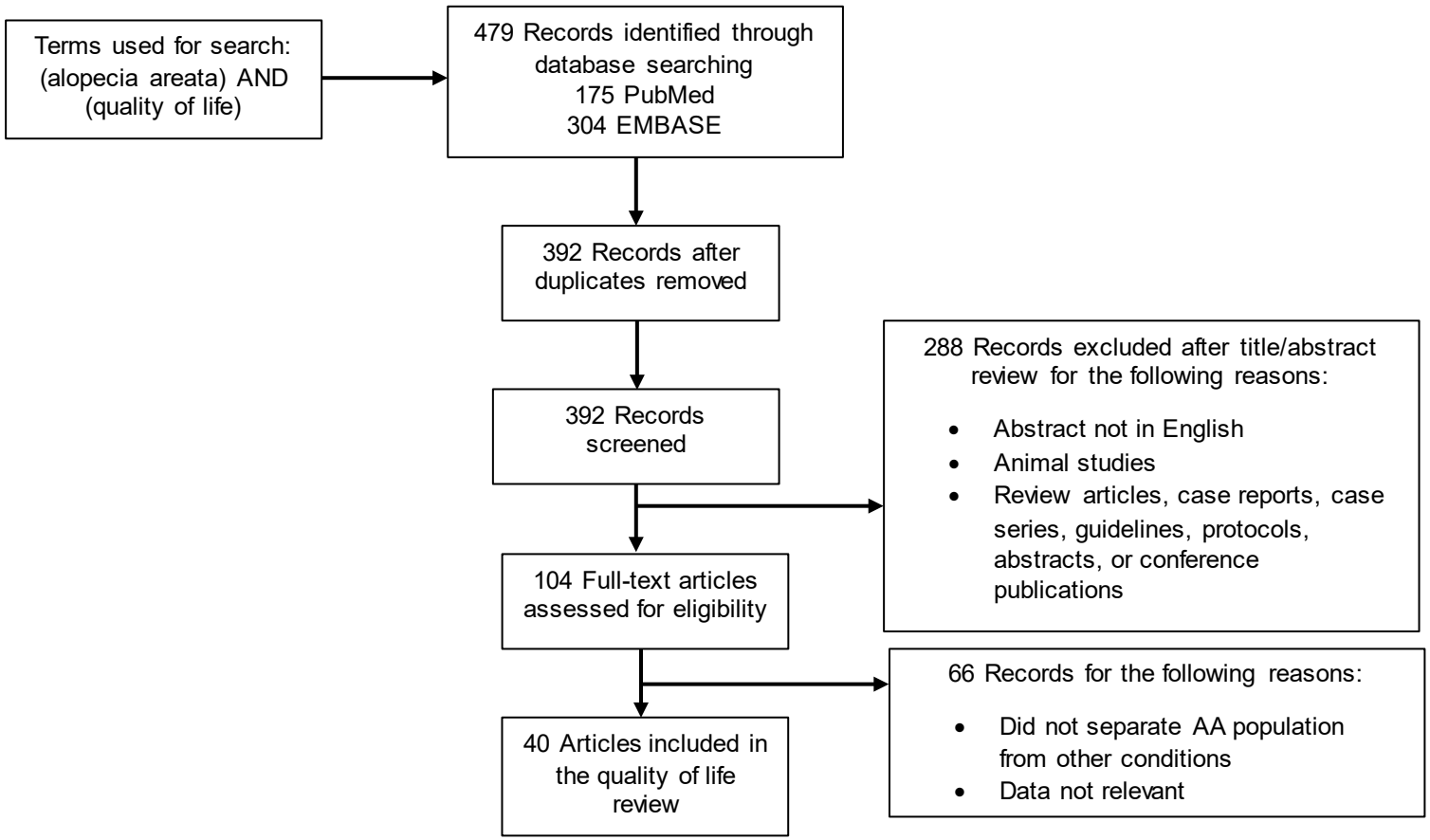
(a)



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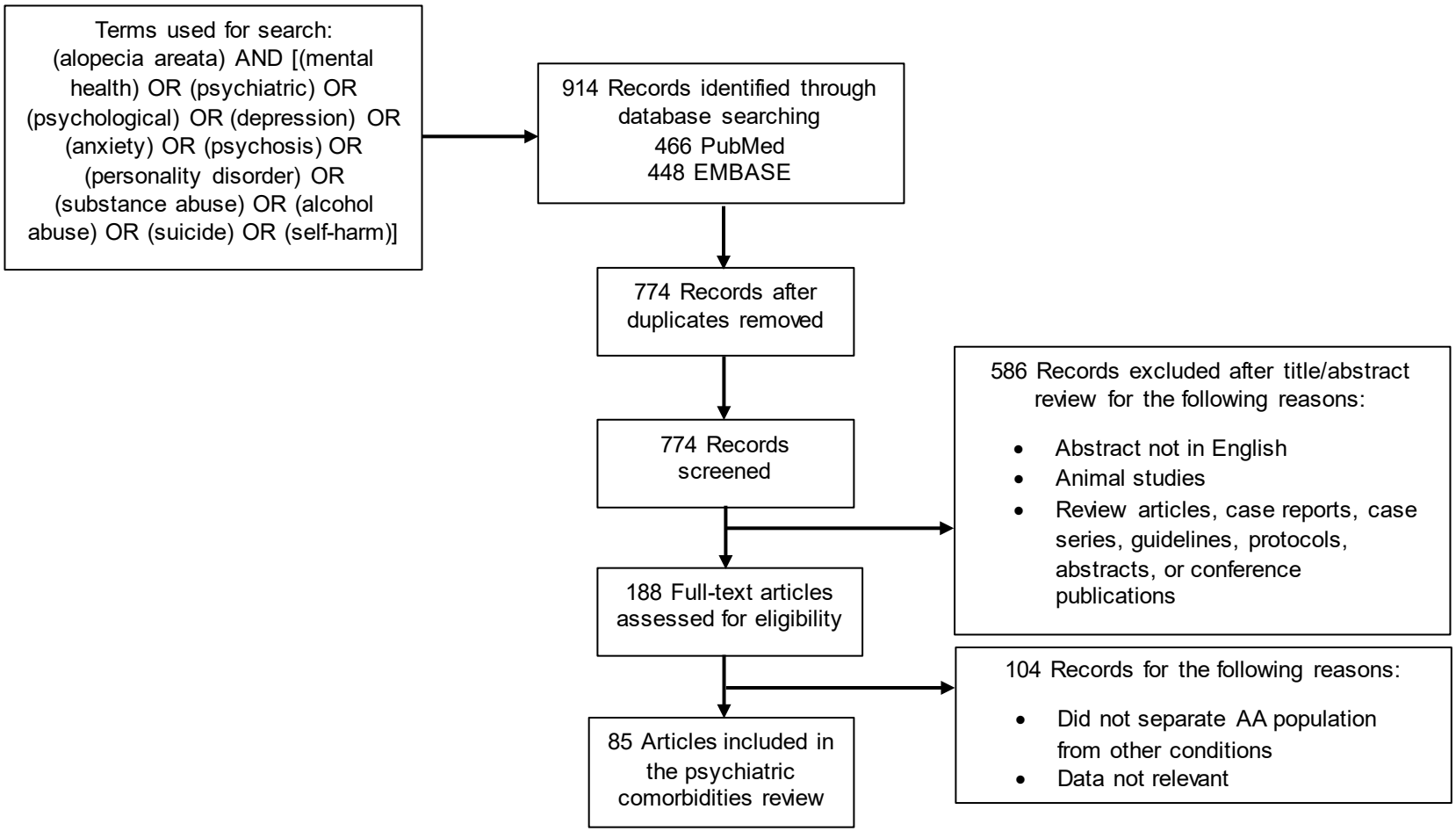

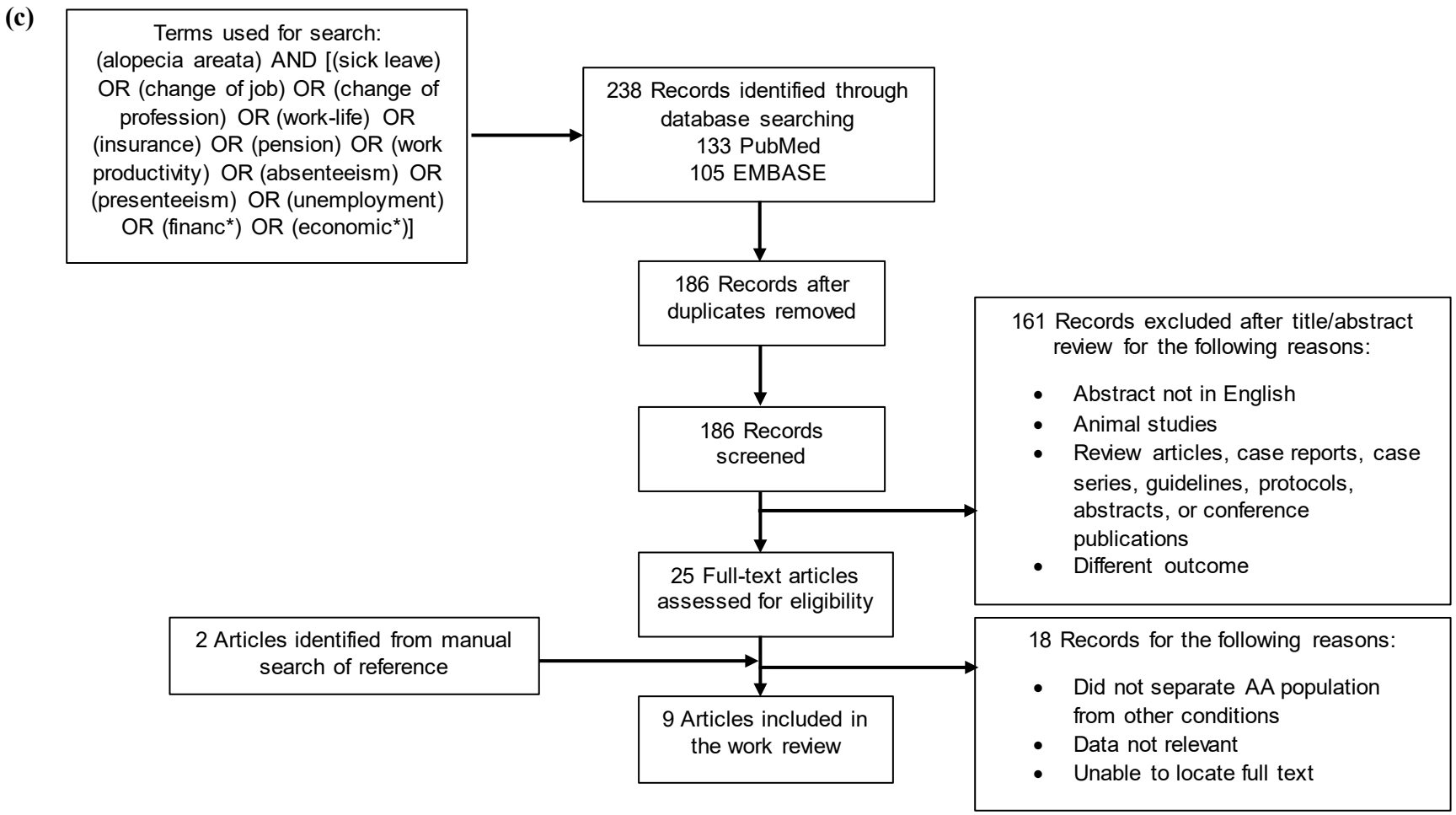

Figure 1. PRISMA flow diagram for inclusion of studies on alopecia areata and quality of life into scoping review (a). PRISMA flow diagram for inclusion of studies on psychiatric comorbidities into the scoping review (b). PRISMA flow diagram for inclusion of studies on absenteeism/presenteeism into the scoping review (c).

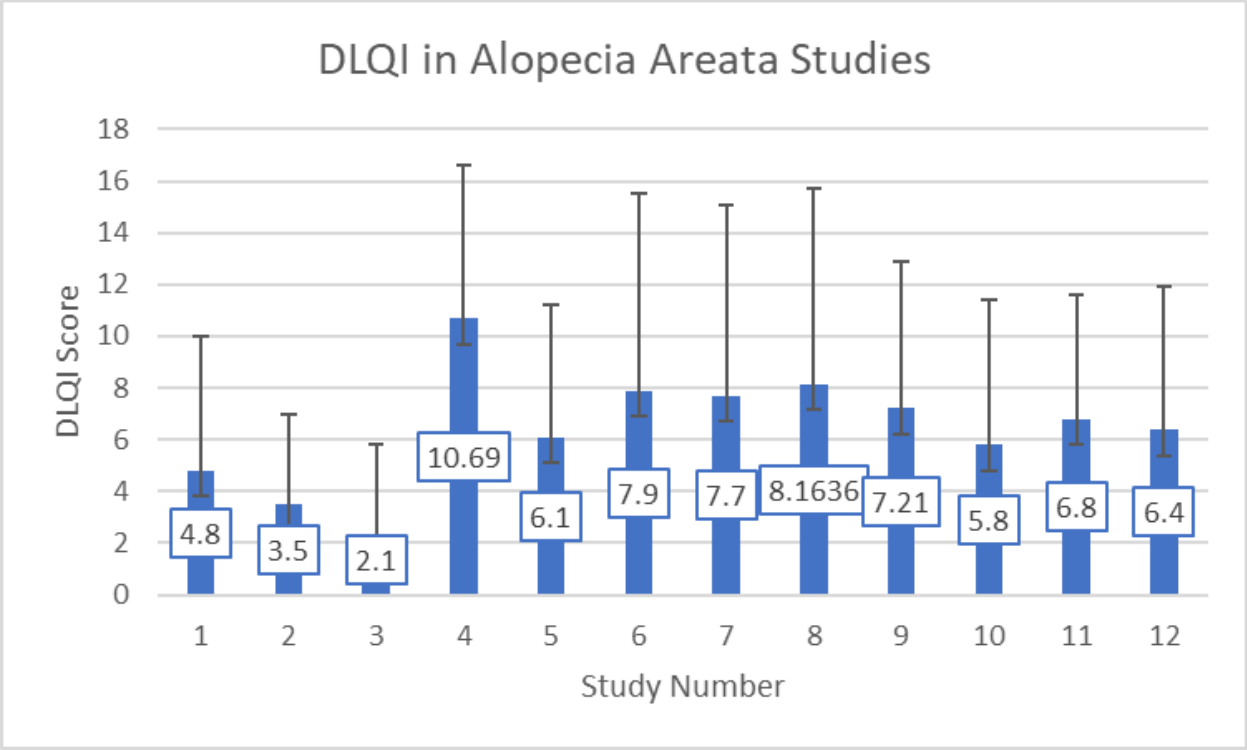

Figure 2. Dermatology Life Quality Index (DLQI) measures from 12 studies. DLQI is measured from 0-30 with the latter indicating more severe impairment. Mean scores are depicted in squares and black bars depict standard deviation.

Figure 3. Patients with varying presentations of alopecia areata (AA). All photographs are courtesy of Dr. Lyn Guenther. Patchy AA in the beard in a male patient. His AA is hidden when wearing masks, however he is concerned when he has to remove them (a). Patchy AA with regrowth at sites of intralesional steroid injections in a female patient. She is self-conscious that areas might show, particularly when windy, and is worried about the development of new patches (b). Ophiasis pattern of AA in 15-year-old boy (c). Alopecia universalis in a 36-year-old male patient who lost his hair overnight. The patient refused to see his family and stayed in his room for the first few months. He now always wears a hat (d).

Table 1. Summary of studies on quality of life with AA

Author	N	Demographics	Measure	Design	Key findings (mean (SD))†	Predictors of poor QoL
Skindex in Adult Populations						
Essa et al.[91]	17	N/A	Skindex-16	Cross-sectional	39.8 (19.5)	Lower educational level (symptoms domain), female sex (emotional domain), low income, longer disease duration, and the use of medications (emotional and functioning domains).
Gelhorn et al.[28]	1327	Mean age: 39.7 Females: 58.4%	Skindex-16	Cross-sectional, web survey through National Alopecia Areata Foundation	Emotions domain: 63.0 (24.9); Functioning domain: 52.5 (27.0); Symptoms domain: 42.4, (26.8)	Worse QoL in 21-49% scalp hair loss; highest emotional impact in the 50-94% of scalp hair loss group; highest burden on Functional impacts in the 21-94% of scalp hair loss.
Jun et al.[15]	161	N/A	Hair Specific Skindex-29	Case control	Composite Score: 35.7 (SD N/A)	Worse functional impairment in patients in their 30s and a disease duration of ³5 years.

Liu et al. [27]	30	Mean age: 38.0 Females: 46.7%	Skindex-16	Open label clinical trial of tofacitinib	At baseline (median): Emotions domain: 88.1; Symptoms domain: 4.3; Functioning domain: 70.0; Composite: 65.1.	
Reid et al.[30]	23	N/A	Skindex-16	Cross-sectional	Symptoms score: 25.4 (4.0); Emotions score: 82.1 (3.3); Function score: 52.2 (6.3); Global score: 58.6 (3.4).	
Sampogna et al.[92]	52	N/A.	Skindex-17	Cross-sectional	Symptoms score: 9.8 (no SD reported)	
Senna et al.[23]	259	Mean age: 39.1 Females: 50.6%	Skindex-16	Cross-sectional survey	Emotions domain: 54.7 (30.7); Symptoms domain: 17.1 (22.9); Functioning domain: 28.2 (29.9); Total Score: 37.1 (23.6).	Female sex was associated with worse scores across domains. Severity as reported by the patients predicted poor QoL whereas measured by physician (using SALT score) did not.

Yoon et al.[81-]	1203	Mean age: 38.9-40.1 Females: 47.9%	Skindex-29	Cross-sectional nationwide survey in Korea	Mean score N/A. QoL impaired in 30.3% of patients, severely in 9.9%. Functioning domain: 71.3% affected, 50.2% severely; Emotions domain: 81.7% affected and 60.2% severely impaired.	Anxiety and depression associated with worse QoL.
DLQI in Adult Populations						
Abedini et al.[19]	176	Mean age: 31.2-31.6 Females: 12.5% (mild AA) and 63.8% (severe AA)	DLQI	Cross-sectional	7.9 (7.6) Mild AA: 5.4 (6.8) Severe AA: 10.7 (7.5)	Longer disease duration and acute stress associated with poor QoL.
Abideen et al.[84]	60	Mean age: 33.9 Females: 35%	DLQI	Cross-sectional	Mean score N/A. QoL affected in 70% of cases. DLQI score 0-1: 30% DLQI score 2-5: 55% DLQI score 6-10: 6.7% DLQI score 11-20: 8.3%	Worse QoL associated with disease severity and psychiatric morbidity.

Al-Mutairi et al.[93]	300	80% of patients aged 20-40 Females: 30.3%	DLQI	Case control focused on severe AA	13.5 (SD N/A)	Disease duration and severity associated with poor QoL.
Andersen et al.[94]	1494	Mean age: 51.3 Females: 67.1%	DLQI	Population-based, cross-sectional study using data from the extended Danish Skin Cohort	2.1 (3.7)	
Ferentinos et al.[95]	52	Mean age: 42.8 Females: 63.5%	DLQI	Case-control	3.5 (3.5)	DLQI worse with number and impact of stressful life events.
Qi et al.[20]	698	Mean age: 38.8 Females: 50%	DLQI	Cross-sectional survey	5.8 (5.6)	Higher DLQI in patients with longer disease duration, disease recurrence, younger patients and presence of scalp symptoms.
Russo et al.[88]	27	Mean age: 33.6-39.6 Females: 66.7%	DLQI	Cross-sectional	Female: 6.7 (4.9) Male: 3.0 (3.2)	

Willemse et al.[27]	243	Mean age: 37.9 Females: 89%	DLQI	Cross-sectional web survey	Mean score N/A. 84% had some QoL impairment, with 26% large and 5% extremely large effect.	Illness perception, identity, and emotional representation predicted poor QoL.
Yu et al.[32]	130	Mean age: 31.8 Females: 58.5%	DLQI	Case control	7.2 (5.7)	Illness perception, identity, and emotional representation predicted poor QoL.
Zhang et al.[16]	55	N/A	DLQI	Case control	8.2 (7.6)	Higher DLQI score correlated with younger age and hair loss for a duration > 12 months.
DLQI in Pediatric Populations						
Putterman et al.[21]	153	Mean age: 11.0 (children) Female-to-male ratio: 1.3:1	QLCCDQ, FDLQI, CDLQI	Prospective, cross-sectional study of AA children and their parents	Emotional domain: 4.6 (1.5), Occupational domain: 6.4 (0.96), Social domain: 6.4 (1.1), Family domain: 6.5 (0.9), Symptom domain: 5.2 (1.7); FDLQI: 6.5 (5.3); CDLQI: 4.4 (4.9)	Worse QoL with AA severity and older age of the child.
DLQI in Mixed Populations (Children and Adults)						

Liu et al.[12]	292 adults, 91 children	Mean age: 41 (adults) and 10 (children) Females: 65.6-72.1%	DLQI, CDLQI, FDLQI	Cross-sectional web survey	DLQI: 7.7 (7.4); CDLQI: 6.3 (5.9); FDLQI: 6.7 (6.1)	History of psychiatric/psychologic consultation and spending >$5000 on treatment s predicted worse QoL. Families of children had worse FDLQI than families of adults.
Velez-Muniz et al.[13]	126	Mean age: N/A Females: 56%	DLQI, cDLQI	Cross-sectional	DLQI: 6.1 (5.1) cDLQI: 2.3 (1.0)	Worse QoL in adult women and boys (children).
Other Scoring Tools in Adult Populations						
Balieva et al.[96]	33	Mean age: 42.8 Females: 66.7%	EQ VAS	Multicentre cross-sectional study conducted in 13 European countries	69.7 (18.1)	

de Hollanda et al.[97]	37	Mean age: 35.9 Females: 62.2%	SF-36	Case-control study	Vitality: 61.8 (22.5); Mental Health: 63.9 (22.2); Emotional: 70.3 (39.1); Social functioning: 70.6 (26.6); Pain: 74.3 (21.9); General health: 77.9 (16.4); Physical functioning: 87.5 (13.7); Role physical: 88.5 (28.6).	
Gonul et al.[31]	56	Mean age: 29.3 Females: 44.6%	Hairdex, TQL	Case control	Hairdex: 57.0 (27.0); TQL: 13.5 (9.9)	Worse emotion domain in females than males.Worse emotions, functioning, stigmatization, and self-confidence, total Hairdex, and TQL scores in patients with increasing disease severity and disease duration.
Gulec et al.[98]	52	Mean age: 31.5 Females: 34.6%	SF-36	Case-control study	Physical functioning: 90.2 (17.2); Pain: 76.3 (22.9); Vitality: 51.4 (20.7); Social functioning: 71.8 (24.5); Mental health: 55.7 (17.9); General health: 65.0 (20.0); Role physical: 83.2 (29.6);	

					Role emotional: 59.8 (42.2.	
Li et al.[37]	81	Mean age: 39.7 Females: 79%	SQOL-F, SQOL-M	Cross-sectional web survey in the National Alopecia Areata Foundation patient registry	SQOL-F: 51.3 (22.9) SQOL-M: 62.7 (33.9)	
Masmoudi et al.[24]	50	Mean age: 32.9 Females: 52%	SF-36	Cross-sectional study	69.0 (13.1)	Relationship between poor QoL and severity of AA.
Roest et al.[26]	256	Mean age: 48.5 Females: 83.8%	NP	Cross-sectional survey	0.9 (1.6)	Nail involvement only marginally affected QoL.
Sousa et al.[17]	50	Mean age: 27.8 Females: 34%	WHO-QOL	Case control	WHO-QOL: 276.5 (54.3)	Worse QoL with psychiatric comorbidity and severity of psychiatric illness.

Other Scoring Tools In Pediatric Populations						
Bilgic et al.[53]	74	Mean age: 12.1 Females: 44.6%	PedsQL-C, PedsQL-P	Cross-sectional study	PedsQL-C: 74.0 (13.4) PedsQL-P: 70.3 (13.4)	Worse QoL with AA severity, disease duration, anxiety and depression. Age at onset positively predicted total QoL score.
Multiple Tools in Adult Populations						

Dubois et al.[99]	60	Mean age: 40.1 Females: 65%	SF-36, VQ-Dermato, Skindex-29	Cross-sectional study	*SF-36* Physical functioning: 88.2 (22.5); Role physical: 73.3 (35.0); Bodily pain: 77.2 (20.7); General health: 64.3 (22.7); Vitality: 54.5 (20.4); Social functioning: 58.9 (29.5); Role emotional: 64.1 (39.1); Mental health: 49.3 (20.4). *VQ-Dermato* Self-perception: 51.4 (26.2); Daily life: 13.9 (17.7); Mood state: 34.2 (24.1); Social functioning: 31.8 (25.1); Leisure activity: 23.9 (28.4); Treatment related: 30.3 (30.2); Physical discomfort: 25.0 (26.9) *Skindex-29* Emotions: 48.9 (27.8); Symptoms: 18.3 (19.7); Functioning: 28.0 (24.6).	Disease severity, extrascalp involvement and younger age were related with altered QoL.

Edson-Heredia et al.[60]	587	Mean age: 43.7 Females: 62%	Skindex-16, EQ-5D-5L	Cross-sectional dermatologists' survey (Adelphi AA Disease Specific Programme)	Emotions domain: 59.9 (30.7); Functioning domain: 45.5 (32.3); Symptoms domain: 20.1 (23.2) EQ-5D-5L: 0.85 (0.12)	
Fabbrocini et al.[92]	50	Mean age: N/A Females: 78%	DLQI, AA-QLI	Cross-sectional study	Mean scores N/A. Average DLQI score: 49.5. Average AA-QLI score: 41.0.	
Ghajarzadeh et al.[100]	100	Mean age: 23.0 Females: 31%	SF-36, DLQI	Cross-sectional study	SF-36: 68.0 (15.1) DLQI: 6.4 (5.5)	
Ito et al.[22]	400	Mean age: 42.9 Females: 67.3%	SF-36v2, DLQI	Cross-sectional web-based survey	*SF-36v2* Mental component: 45.6 (9.6); Physical component: 50.2 (10.9) DLQI: 4.8 (5.2)	Higher anxiety and depression scores, hair loss range, age, comorbidities worsened QoL

Jankovic et al.[88]	60	Mean age: 37.4 Females: 73.3%	SF-36, DLQI, Skindex-29	Cross-sectional study	*SF-36* Physical functioning: 89.3 (15.8); Role physical: 73.1 (37.0); Bodily pain: 82.3 (26.3); General health: 61.1 (20.5); Vitality: 59.3 (12.4); Social functioning: 70.8 (27.0); Role emotional: 65.6 (42.9); Mental health: 50.1 (6.8). *DLQI* Symptoms and feelings: 1.4 (1.1); Daily activities: 1.2 (1.7); Leisure: 1.1 (1.5); Work or school: 0.6 (1.0); Personal relationships: 0.5 (1.1); Treatment: 0.5 (0.9). *Skindex-29* Symptoms: 12.9 (14.4); Emotions: 36.2 (25.8); Social functioning: 22.0 (22.6)	AA severity and age was associated with worse QoL.

Lai et al.[80]	36	Mean age: 41 Females: 80.6%	AASIS, AQoL-8D	Randomized, placebo-controlled trial with cyclosporin	At baseline: Global Symptoms Impact: 0.4 (0.2); Global Interference: 0.3 (0.3); AQoL-8D: 0.7 (0.2)	Improved QoL with treatment.
Nasimi et al.[90]	100	Mean age: 29.2 Females: 35%	DLQI, AA-QLI	Cross-sectional study	DLQI: 10.7 (5.9) AA-QLI: 48.0 (9.8)	Worse QoL associated with female sex, younger age, age at onset, severity of hair loss, and treatment delay.
Shi et al.[29]	532	Mean age: N/A Females: 73%	Skindex-16, DLQI	Cross-sectional study from National Alopecia Areata Registry	*Skindex-16* Symptom scale: 18.8 (24.2); Emotional scale: 43.3 (33.3); Function scale: 30.2 (30.8); *DLQI*: 6.8 (4.8)	Risk factors for poor QoL included age between 20-50 years, female sex, lighter skin color change, hair loss 26-50%, hair loss 76-99%, family stress and job change.
Titeca et al.[101]	37	N/A	DLQI, EQ-5D-3L	Cross-sectional multicentre study in 13 European countries	N/A	Higher DLQI scores in AA compared to controls; Lower EQ-5D-3L scores in AA compared to controls

AA: Alopecia areata

AASIS: Alopecia Areata Symptom Impact Scale – ranges from 0-10; higher scores indicate more severe patient-reported impact.

AA-QLI: Alopecia Areata-Quality of Life Index Questionnaire – ranges from 21-84; higher scores indicate higher impact of alopecia areata on quality of life.

AQoL-8D: Assessment of Quality of Life with 8 Dimensions – ranges from 0 to 45; higher scores indicate poorer quality of life.

CDLQI: Children's Dermatology Life Quality Index – ranges from 0-30; higher scores indicate greater impairment of quality of life; score >13 indicates that the patient's life is severely affected.

DLQI: Dermatology Life Quality Index – ranges from 0-30; higher scores indicate greater impairment of quality of life; score >10 indicates that the patient's life is severely affected.

EQ-5D-3L: EuroQoL 5 dimensions with 3 levels - – ranges from less than 0 to 1; higher scores indicate higher health utility.

EQ-5D-5L: EuroQoL 5 dimensions with 5 levels – ranges from less than 0 to 1; higher scores indicate higher health utility.

EQ-VAS: EuroQol 5 dimension Visual Analogue Scale – ranges from 0-100; higher scores indicate better health.
FDLQI: Family Dermatology Life Quality Index – ranges from 0-30; higher scores indicate greater impairment of quality of life.
Hair Specific Skindex-29 – ranges from 0-100; higher scores indicate lower levels of quality of life.
Hairdex – ranges from 0-116; higher subscale scores indicate more adverse effects on quality of life.
N/A: not reported.
NPQ10: Nail-Related Quality of Life – ranges from 0-18; higher scores indicate decreased quality of life.
PedsQL-C: Pediatric Quality of Life Inventory - Child Form - range from 0-100; higher scores indicate better health-related quality of life.
PedsQL-P: Pediatric Quality of Life Inventory - Parent Form – range from 0-100; higher scores indicate better health-related quality of life.
QLCCDQ: Quality of Life in a Child's Chronic Disease Questionnaire – ranges from 1-7 over 15 questions; lower scores indicate greater impairment of quality of life
QoL: Quality of Life
SF-36: 36-Item Short Form Survey – ranges from 0-100; lower scores indicate greater disability.
SF-36v2: 36-Item Short Form Survey version 2 – ranges from 0-100; lower scores indicate greater disability.
Skindex-16 – ranges from 0-100; higher scores indicate lower levels of quality of life.
Skindex-17 - ranges from 0-100; higher scores indicate lower levels of quality of life.
Skindex-29 – ranges from 0-100; higher scores indicate lower levels of quality of life.
SQOL-F: Sexual Quality of Life – Female – ranges from 18-108 or 0-90; higher scores indicate better female sexual quality of life.
SQOL-M: Sexual Quality of Life – Male- ranges from 11-66; higher scores indicate better male sexual quality of life.
TQL: dermatology quality of life instrument in Turkish – ranges from 0-44; higher scores indicate lower quality of life.
VQ-Dermato – ranges from 01-00; higher score indicates lower level of quality of life.
WHO-QOL: The World Health Organization Quality Of Life – items range from 1-5 to determine a raw item score; the mean score for each domain range from 4-20; mean domain score is multiplied by 4; higher score indicates higher quality of life.

† If applicable, mean and standard deviation of tools were included in table. In cases where mean (SD) were not available for extraction, percentages or other quantitative factors were presented.

Table 2. Summary of studies on psychiatric comorbidities with AA

Author	N	Demographics (mean age, % female)	Measures†	Study Design	Key findings (mean and SD)
Mood and anxiety spectrum disorders in adults					
Aghaei et al.[102]	40	Mean age: N/A Females: 56.2%	BDI, EPQ	Case-control study	Significant differences between AA patients and controls regrading depression, anxiety, and neuroticism, but no significant differences were detected with extraversion, psychosis, and lying.

Alfani et al.[103]	73	Mean age: 35.2 Females: 54.8%	MMPI-2	Cross-sectional, case-control study	Scores on the scales of Depression, Hysteria, Psychopathic deviance, Psychasthenia, Schizophrenia, Anxiety, Health concerns, Bizarre thoughts and Family problems were significantly higher in patients with AA compared with controls.
Baghestani et al.[47]	68	Mean age: 35.4 Females: 28%	Hamilton Rating Scale	Case-control study	Anxiety: 12.76 (7.21); Depression: 12.84 (4.03)
Bain et al.[81]	39	Mean age: 37-45 Females: 76.9%	HADS	Cohort study	Depression: 18% (8% mild, 3% moderate, 8% severe) Anxiety: 51%

Balieva et al.[96]	33	Mean age: 42.8 Females: 66.7%	Risk of depression/anxiety	European multicentre, observational cross-sectional study in 13 countries	Four-fold increase for patients with AA
Bashir et al.[82]	3	Not reported	Rate of depression	Cross-sectional study	33.3%
Bitan et al.[49]	1936	Mean age: 50.2 Females: 57.0%	Temporal association between AA and depression	Population-based study	Patients with AA have greater odds of subsequent depression within 2 years from AA diagnosis with a steeper increase in cumulative probability of depression as time progressed (log-rank = 336.38, $p<0.001$)

Bitan et al.[51]	41055	Mean age: 40.0 Females: 37.1%	Association with depression, anxiety, and schizophrenia	Nationwide population-based study in Israel	Patients with AA had higher rates of depression (OR 1.1, 95% CI 1.03-1.17, p<0.01) and anxiety (OR 1.24, 95% CI 1.15-1.33, p<0.001). Schizophrenia was found to be negatively associated with AA (OR 0.068, 95% CI 0.58-0.79).
Cakira et al.[45]	33	Mean age: 26.3 Females: 24.2%	HADS	Case-control study	Depression score: 8.67 (3.11); Anxiety score: 9.45 (3.40)
Chaudhury et al.[104]	25	Mean age: 31.2 Females: 4%	SAS, HDRS	Case-control study	SAS: 29.92 (13.34); HRDS: 8.08 (3.73)

Colon et al.[83]	31	Mean age: 35 Females: 71%	Prevalence rates of psychiatric disorders	Cohort study	Any: 74%; Major depression: 39%; Generalized anxiety disorder: 39%; Tobacco use disorder: 35%; Psychosexual dysfunction: 26%; Phobic disorder; 23%; Alcohol or drug abuse/dependence: 23%; Dysthymic disorder: 16%; Antisocial personality disorder: 13%; Panic disorder: 13%; Bipolar disorder: 6%; Post-traumatic stress disorder: 3%; Obsessive-compulsive disorder: 3%; Bulimia: 3%; Pathological gambling: 3%.

Dai et al.[105]	2123	Mean age: 31.3 Females: 55.2%	Adjusted relative risk (RR) with major depressive disorder	Nationwide population-based study in Taiwan	Patients with AA had adjusted RR of 8.22 (95% CI, 6.41-10.54) for major depression disorder.
Devar et al.[106]	30	Mean age: N/A Females: 0%	Schedule of Recent Experience, Taylor's Manifest Anxiety Scale, BDI, Hostility Direction and Hostility Questionnaire of Fould's and Cattell's 16 PF Questionnaire (Form E)	Case-control study	Schedule of Recent Experience: 166.07 (90.58); Taylor's Manifest Anxiety Scale: 24.60 (10.90); BDI: 20.47 (13.08); Hostility Direction and Hostility Questionnaire of Fould's and Cattell's 16 PF Questionnaire (Form E) - Nervous tension: 5.87 (2.15); Depressive agitated anxiety: 5.97 (1.24); Depressive tendency: 5.20 (2.09).

Edson-Heredia et al.[60]	587	Mean age: 43.7 Females: 62.0%	HADS	Cross-sectional dermatologists' survey (Adelphi AA Disease Specific Programme)	Depression score: 5.36 (4.42); Anxiety score: 6.21 (4.61)
Egeberg et al.[107]	1843	Mean age: 36.7 Females: 64.9%	Incidence rate ratio (IRR) of antidepressant and anxiolytic drug use	Danish nationwide register-based cohort study	Patients with AA had higher use of antidepressant drugs (IRR = 1.26 [95% CI, 1.01-1.56]) and anxiolytic drugs (1.55 [95% CI, 1.17-2.05]) compared to healthy controls.
Erfan et al.[108]	42	Mean age: 35.7 Females: 33.3%	TCI	Cross-sectional study	Novelty seeking: 18.88 (5.01); Harm avoidance: 16.83 (6.71); Reward dependence: 13.78 (3.13); Persistence: 4.80 (1.95).

Ferentinos et al.[95]	52	Mean age: 42.8 Females: 63.5%	HADS	Case-control study	Depression score: 5.47 (3.8); Anxiety score: 7.45 (4.1)
Ghajarzadeh et al.[100]	100	Mean age: 23.0 Females: 31%	BDI	Case-control study	14.4 (9.7)
Gupta et al.[55]	45	Mean age: 44.7 Females: 75.6%	CRSD	Case-control study	7.5 (7.3)
Gutierrez et al.[109]	2298432 visits for AA	Ages: <21: 19% 21-40: 35% 41-60: 29% 61-80: 17% ³81: 0.6% Females: 65%	Rate of depression	Cross-sectional population-based study	4.3%
Huang et al.[84]	2115	Mean age: 42 Females: 61.7%	Rate of mental health problems	Retrospective cross-sectional study	Depression or anxiety: 25.5%

Ito et al.[22]	400	Ages: 20-29: 15.5% 30-39: 24.5% 40-49: 32.3% 50-84: 27.8% Females: 67.3%	HADS	Cross-sectional web-based study	Depression score: 6.6 (4.5); Anxiety score: 7.4 (4.3)
Kim et al.[85]	543	Ages: 18-39: 38.3% 40-59: 40.0% ³60: 21.7% Females: 63.5%	K6, PHQ2	Cross-sectional population-based study	Higher rates of positive K6 screening (adjusted Odds Ratio [95% CI], 1.57 [1.02-2.41], p = 0.04) and positive PHQ2 screening (adjusted OR [95% CI], .37 [1.05-1.78], p = 0.02). 24.5% had positive PHQ2 screen for depressive symptoms.

Kim et al.[110]	7706	N/A	Prevalence of psychiatric disorders (all), alcohol-related disorders, nicotine dependence, schizophrenia, manic episodes/bipolar disorders, depressive disorders, mood disorders, phobic disorders, anxiety disorders, obsessive-compulsive disorders, reaction to severe stress/adjustment disorders, somatoform disorders, eating disorders, nonorganic sleep disorders, nonorganic sexual dysfunction, personality disorders, habit and impulse disorders	Retrospective cohort study	Psychiatric disorders (all): 318/7706; alcohol-related disorders: 6/7706; nicotine dependence: 1/7706; schizophrenia: 5/7706; manic episodes/bipolar disorders: 11/7706; depressive disorders: 144/7706; mood disorders: 22/7706; phobic disorders: 9/7706, anxiety disorders: 89/7706; obsessive-compulsive disorders: 4/7706; reaction to severe stress/adjustment disorders: 38/7706; somatoform disorders: 26/7706; eating disorders: 1/7706; nonorganic sleep disorders: 42/7706; nonorganic sexual dysfunction: 1/7706; personality disorders: 1/7706; habit and impulse disorders: 2/7706

King et al.[54]	Trial 1 – 654 Trial 2 - 546	Trial 1 – Mean ages: 36.3-38.0 Females: 58.6% Trial 2 – Mean age: 37.1-39.0 Females: 63.2%	HADS at baseline	Double-blind, parallel-group, randomized, placebo-controlled trials to baricitinib	Trial 1 – Anxiety Placebo: 6.7 (3.9) Baricitinib 2mg: 6.2 (3.7) Baricitinib 2mg: 6.1 (3.8) Depression Placebo: 4.0 (3.2) Baricitinib 2mg: 4.2 (3.7) Baricitinib 2mg: 4.0 (3.4) Trial 2 – Anxiety Placebo: 5.9 (4.0) Baricitinib 2mg: 6.2 (3.9) Baricitinib 2mg: 6.4 (3.6) Depression Placebo: 3.7 (3.5) Baricitinib 2mg: 3.8 (3.3) Baricitinib 2mg: 3.8 (3.5)

Koo et al.[111]	294	N/A	Diagnosis of psychiatric disorders	Questionnaire-based study	Met at least one DSM-III criterion of diagnosis: 23.3%; Major depressive episode: 8.8%; Generalized anxiety disorder: 18.2%; Social phobias: 3.5%; Paranoid disorder: 4.4%.
Lee et al.[112]	73107	Mean age: 38.0 Females: 40.7%	All-cause mortality risk - Hazard Ratio (HR)	Korean Nationwide Population-Based Study	Mortality associated with intentional self-harm/psychiatric diseases was greater in patients with AA compared to control group (HR = 1.21, 95% CI, 1.04-1.41)
Maan et al.[86]	50	Mean age: 27.5 Females: 26.0%	Rate of experienced depression	Cross-sectional study	48%

Macbeth et al.[48]	5435	Mean age: 38.9 Females: 54.1%	Rates of depressive episodes (DE), recurrent depressive disorder (RDD), and non-phobia related anxiety disorder (AD)	Population-based study	All common mental health conditions were more prevalent in people with AA (RDD 12.3%, DE 19.4%, AD 16.6%) than in matched controls (RDD 8.6%, DE 14.7%, AD 12.9%)
Marahatta et al.[44]	75	Mean age: 29.4 Females: 46.7%	BDI, BAI	Cross-sectional study	BDI - Median: 5 (IQR = 0.0-10.0) BAI - Median: 5 (IQR = 0.0-11.0)
Matzer et al.[35]	45	Mean age: 38 Females: 77.8%	STANINE of UBV	Cross-sectional survey and qualitative study	Emotional reactions - Anxiety: 5.20 (1.71); Depressiveness: 5.55 (2.00); Aggression: 5.93 (1.79); Mean score of negative emotionality: 5.48 (1.74).

Rajoo et al.[52]	83	Mean age: 41.0 Females: N/A	DASS-21	Cross-sectional study	All patients were considered symptomatic for anxiety and depression. 66.3% reported extremely severe anxiety and 47.0% reported being extremely depressed. 91.4% of participants had mild to severe stress levels, of which 37.3% reported being extremely stressed.
Riuz-Doblado et al.[113]	32	Mean age: N/A Females: 85%	SCAN, IPDE, PAIS	Cohort study	Generalized anxiety: 37.16 (11.70); Depressive episode: 37.00 (10.61); Social phobia: 32.00 (18.38)

Russo et al.[88]	27	Mean age: Females: 39.6 Males: 33.6 Females: 73.4%	STAI-Y, SPI by SPS, SIAS	Single-site cross-sectional study	STAI-Y - Males: 46.5 (11.3), Females: 45.8 (7.8) SPI - Males: 18.8 (11.4), Females: 16.8 (6.1) SIAS - Males: 20.4 (8.1), Females: 21.7 (5.5)

Sahiner et al.[114]	41	Mean age: 32.9 Females: 51%	BDI, BAI, Childhood Traumatic Questionnaire, LES, CIDI	Case-control study	Smoking abuse: 36.65; Alcohol abuse: 7.3%. BDI: 13.2 (10.9). BAI: 12.8 (12.9). Childhood Traumatic Questionnaire: 86.9 (20.7). LES - Adjustment score: 209 (22.0); Distress score: 204.710 (28.974). CIDI: Incidence of active anxiety, depression or depression with anxiety was 41% in the AA group. Previous anxiety or depression or depression with anxiety was 17.1%.
Sayar et al.[115]	31	Mean age: 23.8 Females: 0%	BDI, TAS, BHS, STAI-1, STAI-2, BSI	Case-control study	BDI: 21.0 (10.2); TAS: 12.2 (3.0); BHS: 9.9 (5.4); STAI-1: 46.0 (10.7); STAI-2: 51.5 (9.0); BSI: 80.1 (46.0).

Sellami et al.[42]	50	Mean age: 32.9 Females: 52%	HADS, TAS-20	Cohort study	HADS - Depression score: 8.96 (4.43); Anxiety score: 10.42 (3.49) TAS-20: 56.12 (14.42)
Senna et al.[67]	68121	Mean age: 40.3 Females: 61.0%	Rates of depression, anxiety, alcohol abuse, suicidal ideation	Retrospective, observational claims analysis study	Depression: 8.1%; Anxiety: 6.6%; Alcohol abuse: 0.6%; Suicidal ideation: 0.6%
Sorour et al.[56]	208	Mean age: N/A Females: 41.3%	Rate of psychiatric illness	Cross-sectional study	Depression: 55.29%; Anxiety: 19.71%; Suicidal ideation: 38.46%; Suicide attempt: 4.33%; Sleep disorders: 2.40%; Obsessive compulsive disorders: 2.88%; Sexual problems: 20.19%.
Sousa et al.[17]	50	Mean age: 27.8 Females: 34.0%	Hamilton Rating Scale	Case-control study	Anxiety: 4%; Depression: 18%

Tan et al.[116]	168	Mean age: 34.5 Females: 50.0%	SCL-90-R	Case-control study	Global Severity Index: 1.44 (0.44); Somatization: 1.37 (0.44); Obsessive-compulsive: 1.66 (0.61); Interpersonal sensitivity: 1.46 (0.53); Depression: 1.47 (0.53); Anxiety: 1.44 (0.50); Hostility: 1.50 (0.54); Phobic anxiety: 1.26 (0.41); Paranoid ideation: 1.36 (0.48); Psychoticism: 1.35 (0.47)
Titeca et al.[101]	37	N/A	HADS	Multicentre, observational and case-control study conducted in 13 European countries.	Patients with AA had a higher HADS score compared to patients with androgenetic alopecia.

Yoon et al.[117]	1203	Mean age: 38.9-40.1 Females: 47.9%	BAI, BDI	Nationwide study in Korea	BAI: 10.1% had anxiety, of which 4.2% had severe anxiety. BDI: 40.9% had depression, of which 9.4% had severe depression.
Yu et al.[32]	130	Mean age: 31.8 Females: 58.5%	SDS, SAS		SDS: 43.77 (9.23); SAS: 40.69 (8.19)
Mood and anxiety spectrum disorders in children					

Altunisik et al.[58]	27	Mean age: 11.9 Females: 70.4%	CDI, CSI-24, ERC-ER, ERC-L/N, ERC-Total, PD, SD, SoP, SAD, GAD, SCARED-TOTAL, SAI, TAI, K-SADS-PL	Case-control study	CDI: 8.7 (4.6); CSI-24: 11.2 (8.4); ERC-ER: 20.8 (2.9); ERC-L/N: 34.4 (6.5); ERC-Total: 55.2 (6.5); PD: 37.5 (9.3); SD: 1.2 (1.3); SoP: 5.6 (3.5); SAD: 39.7 (8.3); GAD: 4.4 (3.3); SCARED-TOTAL: 21.6 (13.0); SAI: 34.3 (6.0); TAI: 31.5 (8.2) K-SADS-PL: 62.9% had at least one psychiatric disorder.

Andreoli et al.[89]	176	Mean age: 9.4-10.4 Females: 43%	Rate of psychopathological disorders	Case-control study	Generalized anxiety disorder: 16%; Dysthymic disorder: 10%; Separation anxiety disorder: 8%; Attention deficit/hyperactivity disorder: 2%; Mental retardation: 2%; Other disorders: 3%.
Bilgic et al.[53]	74	Mean age: 12.1 Females: 44.6%	CDI, STAI-C,	Case-control study	CDI: 10.4 (6.9); STAI-C - State-Anxiety: 44.2 (4.8), Trait-Anxiety: 36.3 (6.9)
Conic et al.[118]	3510	Ages: <10: 26.2% 10-18: 73.8% Females: 55.3%	Rate of depression	Cross-sectional study	2.6%

Diaz-Atienza et al.[119]	31	Mean age: 12.2 Females: 48%	CDI, STAI state-anxiety, STAI trait-anxiety	Case-control study	CDI: 9.8 (5.3); STAI state-anxiety: 8.9 (6.8); STAI trait-anxiety: 12.2 (6.9)
Erdogan et al.[46]	31	Mean age: 12.5 Females: 45.2%	Stressful life event, RCADS-Child, RCADS-Parent, Parent's BAI, Parent's BDI	Cross-sectional controlled study	Stressful life event: 61.3%; RCADS-Child: 49.13 (12.9); RCADS-Parent: 56.32 (11.1); Parent's BAI: 11.71 (8.78); Parent's BDI: 10 (6.72)

Ghanizadeh et al.[57]	14	Mean age: 11.7 Females: N/A	Frequency of psychiatric disorders	Cohort study	One or more lifetime psychiatric disorders: 78%; Obsessive-compulsive disorder: 35.7%, Post-traumatic stress disorder: 7.1%; Separation anxiety disorder: 7.1%; Specific phobia: 28.6%; Generalized anxiety disorder: 7.1%; Major depressive disorder: 50%; Attention deficit disorder: 14.3%; Tic disorder: 21.4%; Nail biting: 14.3%.

Liakopoulou et al.[87]	33	Mean age: 10.5 Females: N/A	Child Psychiatric Interview, CDI, CMAS, CBCL, LES-C	Case-control study	Child Psychiatric Interview: All children exhibited symptoms, with 21.2% experiencing severe symptoms. Anxiety: 21.2%; Depression: 15.2%; Both: 63.3%. CDI: 9.4 (7.5) CMAS - Anxiety (Worry and Oversensitivity): 14.27 (3.7); Lie (Social impeccability): 17.6 (3.5); Anxiety (Psychological): 7.7 (2.2); Anxiety (Concentration): 8.9 (2.6); Lie (Over self-control): 6.1 (1.6). CBCL: 59.67 (19) LES-C - Positive life events absent: 84.6%.

Reeve et al.[120]	12	Mean age: 11.5 Females: N/A	RCMAS, Children's Depression Scale, LECL, CDRS-Revised, Piers-Harris Children's Self-concept Scale, FES, CBCL, SCL-90-R	Cohort study	RCMAS: 6.2 (6.4); Children's Depression Scale: 44.4%tile (31.5); LECL: 4.1 (3.0), CDRS-Revised: 26.0 (7.6); Piers-Harris Children's Self-concept Scale: 64.6 (10.7); FES: 8.6 (no SD reported), CBCL - Maternal Report - Internalizing: 57.6 (11.7); Externalizing: 50.4 (9.1); Paternal Report - Internalizing: 58.6 (8.6), Externalizing: 54.6 (8.8). SCL-90-R: Scores not clinically significant.

Sehgal et al.[121]	65	Ages: 0-10: 12.3% 11-20: 15.4% 21-30: 38.5% 31-40: 27.7% 41-50: 4.6% 51-60: 1,5% Females: 29.5%	Psychological impact	Observational Study	Mild psychological impact: 66.15% Moderate psychological impact: 27.6% Patients with a shorter duration of AA were more emotionally disturbed than those with a long history of AA.
Toback et al.[122]	10	Mean age: 7.2 Females: 40%	Psychiatric evaluation: Wechsler Intelligence Scale for Children, the Geometric Forms test, the Goodenough draw-a-man test, the Bender-Gestalt test and the Picture Vocabulary test.		Emotional disturbance - Mild: 50%; Moderate: 40%; Severe: 10%
Mood and anxiety spectrum disorders in mixed studies (children and adults)					

Ataseven et al.[43]	43 (27 adults, 16 children)	Mean age: 23.4 Females: 27.9%	Hamilton Rating Scale (adults), CDI (children)	Case-control study	Hamilton Rating Scale: 33.3% had mild depression, 18.5% had moderate depression, and 7.4% had severe depression. CDI: 22.% had depression. Anxiety: 23.3%
Chu et al.[40]	5117	Ages: 0-19: 17.7% 20-39: 52.5% 40-59: 25.3% ³60: 4.4% Females: 50.8%	Prevalence of psychiatric comorbidities	Case-control study	Any psychiatric disease: 8.1%; Anxiety: 5%; Attention deficit disorder: 0.4%; Bipolar: 0.6%; Depression: 2.9%; Manic: 0.2%; OCD: 0.5%; Phobia: 0.2%; Personality disorder: 0.4%; Schizophrenia: 0.7%. Patients with AA tended to have more coexisting anxiety and less comorbid schizophrenia.

Greenberg et al.[123]	44	Ages: 11-17: 18.2% ³18: 81.8% Females: 45.5%	Psychiatric interviews, Rorschach test		Psychoneurotic: 73%; Borderline psychotics: 9%; Schizophrenic: 9%; Involutional psychosis: 2%.
Laitinen et al.[124]	176	Mean age: 29.7 £10: 24.4% >10: 75.6% Females: 75.0%	Rate of depression	Cohort study using database of Finnish population	4.0%
Macalpine et al.[125]	125	Ages: <10: 4% 10-29: 42% ³30: 54% Females: 62%	Psychiatric status	Cohort study	Mild psychiatric disturbance (neurosis): 22%; Severe psychiatric disturbance (psychosis): 11%.

Montgomery et al.[41]	338	Mean age: N/A Females: 97.3%	PHQ9, GAD	Mixed methods survey	PHQ9: Clinically significant levels of depression were reported by 29%, with 6.6% reporting severe symptoms. GAD: Clinically significant levels of anxiety were reported in 35.5%, with 15% reporting severe anxiety. Clinically significant levels of social anxiety were reported in 47.5%, with 6.6% reporting severe symptoms.
Singam et al.[126]	5605	Mean age: 42.2 Females: 61.7%	Rate of mental health disorders	Cross-sectional sample of U.S. hospitalizations	Inpatients with AA had higher proportions of any mental health disorder (32.8%) compared to controls (20.0%).

Talaei et al.[127]	24	Mean age: 25.4 Females: 67%	TCI, SCL-90-R	Case-control study	TCI - Temperament traits: patients with AA scored higher in Novelty Seeking, Harm Avoidance and Reward Dependence but lower in Persistence; Character traits: scores were higher in Cooperativeness and Self-Transcendence and lower in Self-Directedness. SCL-90-R: Scores in patients were higher in all evaluated psychopathologies. The effect sizes were large for Obsessive-compulsive and Paranoid Ideation and moderate for Interpersonal Sensitivity, Anxiety, Psychoticism, and Global Severity Index.

Vallerand et al.[128]	6861	Mean age: 31.5 Females: 56.1%	Hazard ratio to develop major depressive disorder	Population-based retrospective cohort study	AA was found to increase the risk of subsequently developing major depressive disorder by 34% (HR = 1.34, 95% CI, 1.23-1.46, p<0.001)
Velez-Muniz et al.[13]	94 adults and 32 children	Mean age: 25 Females: 56%	Adults: HADS, Plutchik Suicide Risk Scale, PSS-14 Children: Birleson Depression Self Rating Scale	Cross-sectional study	HADS: 46.8% had symptoms that suggest a clinical problem, 19.1% were borderline cases of depression or anxiety, and 34.1% did not show any signs of depression or anxiety. Plutchik Suicide Risk Scale: 12.8% at risk of committing suicide. PSS-14: 24.5 (8.1). Birleson Depression Self Rating Scale: 6.3% reported symptoms of depression.

Sleep in adults					
Dai et al.[129]	5648	Mean age: 34.1 Females: 73.8%	aHR of sleep disorders	Population-based cohort study in Taiwan	Patients with AA had a significantly increased risk of developing obstructive sleep apnea (aHR = 3.80 [95% CI, 2.53-5.71]) and non-apnea insomnia (aHR = 4.20 [95% CI, 3.68-4.79]).
Inui et al.[130]	105	Mean age: 43 Females: 68.6%	ESS, EDS	Questionnaire-based study	ESS: 5.657 (3.932); EDS: 11.4% of patients
Shakoei et al.[131]	51	Mean age: 29.7 Females: 52.9%	ESS, PSQI	Cross-sectional study	ESS: 7.63 (4.7); PSQI: 7 (4.13)
Stress in adults					

Brajac et al.[59]	45	Mean age: 40.2 Females: 62.2%	Lemyre and Tessier's Mesure de Stress Psychologique, STAI	Cohort study	Trait anxiety - First onset: 31.27 (14.22); Recidivism: 33.42 (12.71)/ Perceived stress - First onset: 55.92 (36.41); Recidivism: 90.32 (50.74).
Gulec et al.[98]	52	Mean age: 31.5 Females: 34.6%	BDI, BAI, LES	Case-control study	BDI: 11.52 (9.1); BAI: 9.29 (9.3); LES - LES distress score: 304.15 (243.20); LES adjustment score: 270.21 (220.66); Total number of life events: 6.11 (4.90)

Gupta et al.[132]	44	Mean age: 44.7 Females: 75%	BSI, STPI, CRSD, SRSS, Stress reactivity	Cohort study	Stress reactivity was correlated significantly with depression, anxiety, paranoid ideation, psychoticism, interpersonal sensitivity, state anger, state anxiety, trait anxiety and CRDS. Prevalence of high-stress reactivity among patients with AA: 15.9%.
Han et al.[133]	141	Mean age: 43.3 Females: 47.8%	PSS-10	Multicenter, cross-sectional survey study	15.8 (7.2)
Manolache et al.[134]	45	Mean age: 30.6 Females: 60%	Stressful events prior to onset of alopecia	Case-control study	68.88% in patients with AA compared to 22.22% in controls. In patients with AA, mean number of stressful events: 1.02 (0.65).

Picardi et al.[135]	21	Mean age: 34.3 Females: 33.3%	Paykel's Interview for Recent Life Events, Experiences in Close Relationships scale, TAS-20, Multidimensional Scale of Perceived Social Support	Case-control study	Total number of stressful events: 2.0 (1.5) Social support: 63.8 (13.4) Attachment - Anxious attachment score: 61.0 (27.3); Avoidant attachment score: 47.6 (20.7) Alexithymia: 51.5 (13.4)
Taheri et al.[136]	61	Mean age: 30.28 Females: 34%	TEQ	Cohort study	2.26 (2.25)
Willamsen et al.[137]	90	Mean age: 42.6 Females: 84.4%	TEC	Case-control study	15.02 (15.97)
Stress in children					

Andreoli et al.[138]	180	Ages: <2: 1% 2-5: 8.8% 6-10: 36.3% 11-14: 53.9% Females: 48%	Paykel's Scale of Stressful Events, H-T-P test, Rorschach's psychodiagnostic test	Case-control study	81% of the subjects had suffered a stressful event or situation during the 6 months preceding the first appearance of AA.
Kakourou et al.[139]	157	Mean age: 5 Females: 47.1%	Rate of stressful life events prior to onset of AA	Retrospective cohort study	9.5%
Manolache et al.[140]	43	Mean age: 7.8 Females: N/A	Stressful events prior to onset of alopecia	Case-control study	58.13% in patients with AA compared to 16.27% in controls. In patients with AA, mean number of stressful events: 0.67 (0.67)
Saraswat et al.[141]	102 children	Ages: <2: 1% 2-5: 8.8% 6-10: 36.3% 11-14: 53.9% Females: 48.0%	Rate of stress	Case control study	67.6% related their disease to a stress component

Stress in mixed studies (adults and children)					
Perini et al.[142]	48	Mean age: N/A Females: 43.8%	Paykel's Revised Interview for Recent Life Events	Case-control study	Stressful life events: 2.56 (no SD reported)
Tan et al.[143]	219	Mean age: 25.2 Females: 55.7%	Stressful life events prior to AA onset	Cohort study	9.8% among 123 respondents
Other (self-esteem, alexithymia, cognition)					
Askin et al.[144]	64 children	Mean age: 12.2 Females: 50.0%	RSES score	Case-control study	Boys - Median (IQR): 1.5 (0-2.5) Girls - Median (IQR): 1 (0-2)
Dehghani et al.[145]	30	Mean age: 30.3 Females: 33.3%	TAS-20	Case-control study	59.1 (11.5)

Li et al.[38]	2534	Mean age: 53.9 (all patients included ³45) Females: 57.6%	Adjusted Hazard Ratio (aHR) for the development of dementia-related comorbidities	Nationwide Cohort Study in Taiwan	Patients with AA were more likely to develop any dementia (aHR = 3.24 [95% CI, 2.14-4.90]), Alzheimer's disease (aHR = 4.34 [95% CI, 1.45-12.97]), and unspecified dementia (aHR = 3.36 [95% CI, 2.06-5.48]) than controls.

AA: Alopecia areata
BAI: Beck's Anxiety Inventory – ranges from 0-63; higher scores indicate more severe anxiety
BDI: Beck's Depression Inventory – ranges from 0-63; higher scores indicate more severe depression
BHS: Beck Hopelessness Scale – range 0–20, higher total scores indicate greater hopelessness
BSI: Brief Symptom Inventory - Global Severity Index (GSI) is calculated using the sums for the nine symptom dimensions of the BSI plus the four additional items (also in BSI) not included in any of the 9 dimensions and dividing by the total number of items to which the individual responded. Maximum number of items is 53 each ranked from 0-4.
CBCL: Child Behavior Checklist – The CBCL/6-18 is to be used for children 6-18 years old. It is comprised of 113 questions, scored on a three-point Likert scale (0=absent, 1=occurs sometimes, 2=occurs often).
CDI: Children's Depression Inventory - 0-54, higher score indicates more severity
CIDI: Composite International Diagnostic Interview - measures the prevalence of mental disorders in percentage
CMAS: Children's Manifest Anxiety Scale - range 1-40, higher score indicates more severity
CRSD: Carroll Rating Scale for Depression – range 0-52, higher scores indicate severity
CSI-24: Children's Somatization Inventory – ranges from 0 – 96; higher scores indicate greater somatic distress
DASS-21: Depression, Anxiety, and Stress Scale – 21 items - ranges from 0-42; higher scores indicate more severe depression, anxiety or stress
EDS: Excessive Daytime Sleepiness - ranges from 0-24; higher scores indicate more severe sleepiness
EPQ: Eysenck Personality Questionnaire – Extraversion/Introversion out of 24, Neuroticism/Stability out of 24, Lie out of 9
ERC-ER: Emotion Regulation Checklist-Emotion Regulation Subscale – 8 items on a 4-point scale weighted both negative and positively, higher scores indicate adaptive emotion regulation skills
ERC-L/N: Emotion Regulation Checklist-Lability/Negativity Subscale – 15 items on a 4-point scale weighted both negative and positively, higher scores reflect dysregulation
ESS: Epworth Sleepiness Scale - ranges from 0-24; higher scores indicate more severe sleepiness
FES: Family Environment Scale – 0 -90 (complete agreement between family members to complete disagreement between family members)
GAD: Generalized Anxiety Disorder - ranges from 0-21; higher scores indicate more severe anxiety
HADS: Hospital Anxiety and Depression Scale – range 0-21 for depression, range 0-21 for anxiety, higher score indicates more severity
HDRS: Hamilton Depression Rating Scale - ranges from 0-52; higher scores indicate more severe depression
H-T-P test: House-Tree-Person Test – projective test that measures different aspects of personality (qualitative test)
IPDE: International Personality Disorders Examination – International Personality Disorders Examination – True-false questions categorized to each personality disorder (59Q – ICD-10 or 77Q – DSMIV). Higher scores indicate a higher tendency to that PD. Variable point system (ex: 0 – 6) for each PD.
K6: 6-item Kessler Psychological Distress Scale – Range 0 – 24; 6 questions scored 0 to 4 each; higher scores indicate high levels of psychological distress.

K-SADS-PL: Schedule for Affective Disorders and Schizophrenia for School-Age Children Present and Lifetime Version - uses dimensional and categorical assessment approaches to diagnose current and past episodes of psychopathology in children and adolescents according to DSM-5
LECL: Life Events Checklist – no formal scoring protocol or interpretation, apart from identifying exposure to traumatic experiences. 6 point nominal scale for each of 16 events known to trigger PTSD.
LES: Life Events Scale - ranges from 11 – 1467; higher scores indicate a higher stress level (score 300+: at risk of illness, score 150-299: moderate risk of illness, score: 150 or less: slight risk of illness)
LES-C: Life Events Scale for Children – ranges from 5 – 216, higher scores indicate a higher stress level
MMPI-2: Minnesota Multiphasic Personality Inventory - 567 item true-false scale, with items contributing towards different personality and psychopathology diagnoses. Higher scores indicate a closer correlation to each diagnosis.
N/A: not reported
PAIS: Psychological Adjustment to Illness Scale – 46 item interview evaluating psychosocial adjustment to illness, scores reported along a 4 point Likert scale.
PHQ2: Patient Health Questionnaire-2 - 2 item screening score with range of 0-6, higher scores indicate a high likelihood of major depressive disorder.
PHQ9: Patient Health Questionnaire-9 – ranges from 0-27; 9 item screening score; higher scores indicate more severe depression.
PD: Panic Disorder - ranges from 0-40; higher scores indicate more severe panic disorder
PSQI: Pittsburgh Sleep Quality Index - 7 component score derived from multiple items, ranged from 0-21 with higher score indicating worse sleep quality.
PSS-10: Perceived Stress Scale - 10 items score ranges from 0-40; higher scores indicate higher perceived stress.
PSS-14: Perceived Stress Scale - 14 items score ranges from 0-56; higher scores indicate higher perceived stress.
RCADS: Revised Children's Anxiety and Depression Scale - 47 item Likert scale, with items contributing to different anxiety disorders or depression. Higher scores indicate more severe disease.
RCMAS: Revised Children's Manifest Anxiety Scale - 37 item Yes-No score, with subscores for different anxiety subscales. Variable point system with higher scores indicating higher anxiety.
RSES: Rosenberg Self-Esteem Scale - ranges from 0-40; higher scores indicate higher self-esteem
SAD: Separation Anxiety Disorder - ranges from 0-81; higher scores indicate more severe Separation Anxiety Disorder
SAI: same as STAI-1 – ranges from 0-80; Higher scores indicate greater anxiety
SAS: Self-rating Anxiety Scale - 20 item scale with ranges from 20-80; higher scores indicate higher anxiety
SCAN: Schedules for Clinical Assessment in Neuropsychiatry – psychiatric clinical diagnostic tool
SCARED: The Screen for Child Anxiety Related Disorders - 41 item scale with a range from 0-82; higher scores indicate more severe Child Anxiety Related Disorders. Subcategories indicate subtype anxiety disorders
SCL-90-R: Symptom Checklist-90-Revised - 90 item scale, range 0-360 with items contributing to scores of multiple psychological problems. Higher scores indicate higher association with each problem
SD: School Phobia - ranges from 0-144; higher scores indicate higher school phobia
SDS: Self-rating Depression Scale - ranges from 20-80; higher scores indicate more severe depression
SoP: Social Phobia (diagnosis)
SIAS: Social Interaction Anxiety Scale - ranges from 0-80; higher scores indicate more severe anxiety
SPI by SPS: Social Phobia Index by Social Phobia Scale – ranges from 0-80, higher scores indicate higher anxiety about being observed or scrutinised
SRSS: Social Readjustment Rating Scale - ranges from 0-1470; higher scores indicate higher level of stress
STAI: State-Trait Anxiety Inventory - ranges from 0-80; Higher scores indicate greater anxiety
STAI-1: State Anxiety Inventory - ranges from 0-80; Higher scores indicate greater anxiety
STAI-2: Trait Anxiety Inventory- ranges from 0-80; Higher scores indicate greater anxiety
STAI-C: State-Trait Anxiety Inventory for Children - ranges from 20-60; Higher scores indicate greater anxiety
STAI-Y: Trait Anxiety Inventory, Form Y - ranges from 0-80; Higher scores indicate greater anxiety
STANINE of the UBV: STANdard NINE of the stress and coping process questionnaire– ranges from 1-9, the higher value indicating in higher percentile
STPI: Spielberger State-Trait Personality Inventory - ranges from 10-40, higher scores indicate higher level of trait anxiety
TAI: same as STAI-2 – ranges from 0-80; Higher scores indicate greater anxiety
TAS-20: Toronto Alexithymia Scale - ranges from 20-100; higher score the higher chances of alexithymia
TCI: Temperament and Character Inventory - self-assessment questionnaire, consists of 240 dichotomous answers (true/false). Of these, 116 explore the four temperamental dimensions and 119 evaluate the three dimensions of the character.
TEC: Traumatic Experiences Checklist - ranges from 0-29; higher values indicate more trauma experienced.
TEQ: Traumatic Events Questionnaire- ranges from 0-9 assessing different types of trauma. Higher scores indicating more trauma experienced.

† The following measures were used to screen for psychiatric disorders: BAI, BDI, Bender-Gestalt test, BHS, Birleson Depression Self Rating Scale, BSI, CDI, Childhood Traumatic Questionnaire,

Children's Depression Scale, CIDI, CRDS, CRDS-Revised, CSI-24, DASS-21, EDS, EPQ, ERC-ER, ERC-L/N, ERC-Total, ESS, Experiences in Close Relationships Scale, FES, GAD, Geometric Forms test, Goodenough draw-a-man test, H-T-P test, HADS, HDRS, Hostility Direction and Hostility Questionnaire of Fould's and Cattell's 16 PF Questionnaire (Form E), K6, Lemyre and Tessier's Mesure de Stress Psychologique, LECL, LES, LES-C, Multidimensional Scale of Perceived Social Support, PAIS, Paykel's Interview for Recent Life Events, Paykel's Revised Interview for Recent Life Events, Paykel's Scale of Stressful Events, PHQ2, PHQ9, Picture Vocabulary test, Piers-Harris Children's Self-concept Scale, Plutchik Suicide Risk Scale, PSQI, PSS-10, PSS-14, RCADS, Rorschach's psychodiagnostic test, RSES, SAI, SAS, SCARED-TOTAL, Schedule of Recent Experiences, SCL-90-R, SDS, SIAS, SPI, SRSS, STAI, STAI-Y, STAI-C, STAI-1, STAI-2, STANINE of UBV, STPI, TAI, TAS-20, Taylor's Manifest Anxiety Scale, TCI, TEC, TEQ, Wechsler Intelligence Scale for Children.

The following measures were used in the diagnosis of psychiatric disorders: CBCL, Child Psychiatric Interview, CMAS, IPDE, K-SADS-PL, MMPI-2, RCMAS, SCAN.