

# BMJ Open Association between psychosocial distress, sexual disorders, self-esteem and quality of life with male androgenetic alopecia: a population-based study with men at age 46

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## ABSTRACT

**Objectives** To study the association between androgenetic alopecia (AGA) and its severity with psychosocial well-being in male subjects aged 46 years at the population level.

**Design** Cross-sectional study.

**Setting** The Northern Finland Birth Cohort 1966 (NFBC1966).

**Participants** Data were available for 892 male subjects aged 46 years.

**Interventions** Study subjects underwent comprehensive health examinations including a skin evaluation by dermatologists and determination of AGA according to the Norwood classification. They also filled in a questionnaire battery that included previously validated questionnaires: the Hopkins Symptom Checklist-25, the Beck Depression Inventory-II; the Generalised Anxiety Disorder Screener; a 15-dimensional measure of health-related quality of life; a 12-Item General Health Questionnaire. The battery also included questions about self-esteem and sexual health.

**Main outcome measurements** The presence of AGA and its severity, psychosocial well-being.

**Results** AGA was found in 68.5% of subjects, 27.8% of the cases were severe, 33.2% moderate and 39.0% mild. There was no significant association between the presence of AGA or its severity with depression, anxiety, quality of life, self-esteem or sexual symptoms. Those with severe AGA reported lower sexual activity when compared with those without AGA; however, the difference was not statistically significant.

**Conclusions** Middle-aged men with AGA did not differ from men without AGA in terms of psychosocial well-being.

## INTRODUCTION

Androgenetic alopecia (AGA) is the most common type of hair loss in men.<sup>1</sup> The incidence of AGA increases by age and affects up to 50% of all men by age 50 and 80% by age 80.<sup>2</sup> Its prevalence is highest in the Caucasian population.<sup>3</sup> The aetiology of AGA is multifactorial, but genetic predisposition and hormonal status are particularly prominent.<sup>4</sup>

## Strengths and limitations of this study

- To our knowledge, this is the first study to assess the association between androgenetic alopecia and psychosocial well-being in a large, unselected general population.
- Androgenetic alopecia was diagnosed and classified by dermatologists instead of self-reporting.
- Psychosocial well-being was evaluated from diverse viewpoints by using comprehensive, previously standardised questionnaires.
- Study subjects represent only a middle-age population and thus our findings cannot be generalised to other age groups, such as younger males.
- In previous studies selection bias may have led to offer a flawed impression of the association between androgenetic alopecia and psychosocial well-being.

AGA may begin shortly after puberty but more commonly has later onset.<sup>3</sup> The severity of AGA varies from minor hair loss in the temporal area to complete loss of hair from the entire scalp.

AGA has a significant impact on quality of life (QoL).<sup>5–7</sup> Subjects with AGA have reported elevated levels of body image distress and social self-consciousness, loss of self-esteem, decreased feelings of well-being and impaired QoL.<sup>8–10</sup> Furthermore, AGA is associated with psychological disorders and symptoms like anxiety, somatisation and depression.<sup>5 6 11 12</sup> In addition, impaired sexual function has been documented in subjects with AGA.<sup>10 13</sup>

Psychological features are particularly related to severe hair loss and younger age of onset.<sup>14</sup> A Chinese study group evaluated the psychological symptoms of AGA by using interviews and psychological questionnaires among 761 college students (n=355 with

AGA) and found that AGA was associated with various psychological problems.<sup>12</sup> Decreased QoL was found in AGA patients who were referred to a dermatologic clinic in India (mean age 32 years, n=200)<sup>8</sup> and the same effect was seen in a multicentre study (n=998) performed in dermatological clinics in Korea.<sup>14</sup> Both these studies found that QoL was particularly lowered in patients with earlier AGA onset or more severe hair loss.<sup>12,14</sup>

Many previous studies report AGA to be a very stressful condition with several psychosocial comorbidities.<sup>5,6</sup> However, most have focused on moderately young participants or are limited to special population subgroups, either of which may have caused bias.<sup>5-8,14</sup> To the best of our knowledge, the association between AGA and psychosocial effects has not previously been studied in a large, unselected general population. We wanted to study whether the presence of AGA is associated with psychosocial well-being in an unselected population of middle-aged men at the age of 46 years. We therefore designed the present study, which uses data from the Northern Finland Birth Cohort 1966 (NFBC1966) Study to examine the effects of AGA and its severity on the prevalence of psychological, social and sexual symptoms.

## METHODS

### Study population

The study population is a subset of the NFBC1966 which is a longitudinal research programme. The NFBC1966 initially included all 12058 children in the two northernmost provinces of Finland whose expected dates of birth fell in the year 1966 (covered 48% of Finnish territory and 13.2% of population in 1966).<sup>15</sup> The whole cohort has been evaluated regularly since birth by means of health questionnaires and clinical examinations. At the age of 46 years, all cohort members living in the city of Oulu and its surroundings (100 km distance including rural areas) were invited to the comprehensive health study including several clinical examinations (eg, dermatological evaluation) and health questionnaires (including psychosocial evaluation). The 46-year follow-up study was performed between April 2012 and May 2013 and cohort members were 45–47 years of age at this stage.

### Assessment of hair loss

Full dermatological status was comprehensively determined for all the subjects by the dermatologist or experienced resident.<sup>16</sup> All study subjects were categorised by presence/severity of AGA, as determined by their score on the international Norwood classification system<sup>17</sup> as follows: (0) no hair loss (Hamilton-Norwood (HN) scale I), (1) frontal baldness only (HN scale II–IIIa), (2) frontal hair loss with mild vertex baldness (HN scale III–vertex V), (3) frontal hair loss with moderate vertex baldness (HN scale VI) and (4) frontal hair loss with severe vertex baldness (HN scale VII). AGA was then classified to four groups according to its severity during clinical examination; without AGA (HN I), mild AGA (HN II–III),

moderate AGA (HN III vertex—HN VI) and severe AGA (HN VII).

### Psychological questionnaires

#### Hopkins Symptom Checklist-25 (HSCL-25)

Participants were screened for common psychiatric symptoms using the HSCL-25.<sup>18–20</sup> An individual's total score is calculated as the mean score of all 25 items ranging from 1.00 to 4.00. A high total score is shown to be highly correlated with severe emotional distress.<sup>18,19</sup> Commonly used cut-off points  $\geq 1.55$  and  $\geq 1.75$  were also used in the present study to indicate the presence of psychiatric disorder.<sup>21,22</sup>

#### Self-reported history of depression

Previously diagnosed depression or depressive symptoms was recorded by subjects' response to the question: 'Have you ever been diagnosed with/treated for depression/depressive symptoms by a physician?'

#### Beck Depression Inventory–II (BDI-II)

Current depression was assessed using the BDI-II. The present analysis used total scores of  $\geq 14$  and  $\geq 20$  to define the presence of depressive symptoms.<sup>23</sup> The summary score of the melancholic dimension of the BDI-II was used to subdivide with more frequent melancholic symptoms from those with non-melancholic symptoms.<sup>24,25</sup>

#### Generalised Anxiety Disorder Screener (GAD-7)

The GAD-7 was used as a measure of GAD, with a cut-off score of 10 to define subject as having GAD (<10 mild/moderate; >10 severe).<sup>26</sup>

#### The 15-dimensional measure of health-related quality of life (15D HRQoL)

The 15-D questionnaire is a generic, standardised, well-validated, self-administered measure of HRQoL.<sup>27</sup> Possible total scores range between 0 and 1, with an index value of 1 representing full health, and 0 equivalent to death.<sup>28</sup>

#### 12-item General Health Questionnaire (GHQ-12)

Psychological distress was measured by the 12-item version of Goldberg's GHQ-12, which was developed to screen for non-specific psychiatric morbidity in populations.<sup>29</sup> The responses to individual items are summed to yield a total score varying from 0 to 12. The overall sum of the 12 items was used to categorise study subjects, with 0–2 points indicating 'no distress' and  $\geq 3$  points indicating psychological distress.<sup>30</sup>

#### Self-esteem

The self-esteem of cohort subjects was assessed by following questions: 'I feel accepted and welcomed. I have a feeling that I am a good and valuable person', 'I am seen as a competent and capable person', 'When I look into a mirror, I see a good person.' 'I am proud of my roots and background'. All questions were scored on a scale ranging between 0 and 10 where 0 meant 'never'

and 10 ‘constantly’. The responses were summed and the mean value of scores was recorded.

### Sexual questions

The sexual health of study subjects was evaluated using the following questions: ‘Frequency of days in which morning erection occurred’ ( $\geq 2$  times in a week; once a week, 2–3 times a month, once a month; never), ‘Do you have difficulties in sexual intercourse?’ (Yes/No), ‘How often do you have thoughts of sexual intercourse?’ (Never; once a month; once a week, 2–3 times in a week; daily), ‘What is the frequency of sexual intercourse?’ (Never; once a month; once a week, 2–3 times in a week; daily).

### Education

The study subjects were classified into three subgroups of education: basic education, secondary and tertiary education.<sup>16</sup> The information about education level was obtained from the Finnish National Education Register<sup>31</sup> and was supplemented with responses from self-reported questionnaires. The information on marital status was self-reported.

### Patient and public involvement

No patients were involved in setting the research question, or in developing plans for recruitment, design, implementation and dissemination of the results of this study.

### Statistical analyses

Continuous variables are presented as means and SD or as medians (25% and 75% quartiles) and categorical variables are presented as the number and percentage of subjects in each category. For categorical variables, Pearson’s  $\chi^2$  test was used to identify any differences in proportions between categorical variables. The differences in distribution of clinical characteristics were tested using analysis of variance (ANOVA). Values of  $p < 0.05$  were considered statistically significant.

## RESULTS

In connection with the 46-year follow-up survey of the whole birth cohort, 3181 cohort members were invited to undergo a dermatological examination. Of these, 1932 (60.7%) participated, including 892 men (46.2%), who comprised the population of the present analysis. The mean (SD) age of men at the time of the skin study was 46.4 (0.4), with a range of 45.3–47.6 years.

The baseline characteristics of the study population according to the AGA classification are presented in [table 1](#). AGA was present in 611 (68.5%), with 27.8% of those having severe AGA, 33.2% moderate and 39.0% mild. [Table 2](#) summarises the percentage distribution of AGA in subgroups defined by the above-mentioned psychosocial measures. As shown in [table 2](#), there was no significant association between the presence of AGA and psychosocial symptoms. Furthermore, no association was found between AGA severity and the aforementioned symptoms. Study subjects with severe AGA reported lower sexual activity when compared with those without AGA; however, the difference was not statistically significant ( $p > 0.05$ ).

## DISCUSSION

To our knowledge, the psychosocial effects of AGA have not been previously analysed in a general population. Based on the use of diverse standardised questionnaires, we found that AGA had no effect on the psychosocial well-being of this group of middle-aged men at the age of 46 years.

Subjects with AGA have previously been described to more frequently exhibit avoidant personality traits, anxiety and depression than those without hair loss.<sup>5 6</sup> Interestingly, the findings of the present study differ markedly from those of previous reports. In a recent single-centre study by Tas and co-authors ( $n=353$ ), the risk for psychosexual symptoms was reported to increase with the severity of hair loss.<sup>10</sup> Similarly, QoL was found to be lower

**Table 1** Demographics of study population according to androgenetic alopecia (AGA) classification

	(ALL) N=892	Without AGA N=281	Mild AGA N=238	Moderate AGA N=203	Severe AGA N=170	P value
Marital status						0.120
Married	689 (79.8%)	217 (79.8%)	193 (83.9%)	156 (80.4%)	123 (73.7%)	
Single	173 (20.0%)	54 (19.9%)	37 (16.1%)	38 (19.6%)	44 (26.3%)	
Widower	1 (0.12%)	1 (0.37%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	
Educational level*						0.299
Basic	30 (3.36%)	11 (3.91%)	6 (2.52%)	10 (4.93%)	3 (1.76%)	
Secondary	535 (60.0%)	167 (59.4%)	143 (60.1%)	112 (55.2%)	113 (66.5%)	
Tertiary	327 (36.7%)	103 (36.7%)	89 (37.4%)	81 (39.9%)	54 (31.8%)	

\*Basic education (comprehensive schools), secondary level (upper secondary schools, vocational schools), tertiary level (universities, polytechnics).

**Table 2** The association between androgenetic alopecia and psychological symptoms

	Without AGA N=280†	Mild AGA N=235†	Moderate AGA N=201†	Severe AGA N=169†	P value*
15D HRQoL score (mean, SD)	0.93 (0.08)	0.94 (0.06)	0.94 (0.06)	0.94 (0.06)	0.271
HSCL25 score (mean, SD)	1.31 (0.34)	1.29 (0.29)	1.28 (0.27)	1.30 (0.35)	0.666
HSCL25 score categories					0.679
<1.55	215 (82.1%)	191 (85.7%)	152 (83.1%)	128 (81.5%)	
≥1.55	47 (17.9%)	32 (14.3%)	31 (16.9%)	29 (18.5%)	
HSCL25 score categories					0.264
<1.75	236 (90.1%)	206 (92.4%)	171 (93.4%)	138 (87.9%)	
≥1.75	26 (9.92%)	17 (7.6%)	12 (6.6%)	19 (12.1%)	
BDI II, mean (SD)	5.29 (6.25)	4.70 (5.11)	5.11 (5.72)	4.87 (5.53)	0.684
Melancholic symptoms	2.83 (3.11)	2.41 (2.44)	2.66 (2.87)	2.53 (2.87)	0.404
Non-melancholic symptoms	2.55 (3.61)	2.30 (2.88)	2.45 (3.05)	2.33 (2.89)	0.809
Neurovegetative function	0.37 (0.39)	0.32 (0.32)	0.34 (0.34)	0.32 (0.33)	0.468
Mood	0.16 (0.31)	0.14 (0.23)	0.14 (0.23)	0.14 (0.23)	0.643
Negative affect	0.17 (0.32)	0.14 (0.25)	0.17 (0.29)	0.16 (0.28)	0.606
BDI II score categories					0.560
<14	236 (91.5%)	214 (93.9%)	176 (90.3%)	150 (92.6%)	
≥14	22 (8.5%)	14 (6.1%)	19 (9.7%)	12 (7.4%)	
BDI II score categories					0.430
<20	247 (95.7%)	224 (98.2%)	189 (96.9%)	158 (97.5%)	
≥20	11 (4.3%)	4 (1.8%)	6 (3.1%)	4 (2.5%)	
Self-esteem, mean (SD)	7.88 (1.71)	8.12 (1.56)	7.97 (1.50)	7.83 (1.88)	0.361
'I feel accepted and welcomed. I have a feeling that I am a good and valuable person'					
'I am seen as a competent and capable person'	8.03 (1.42)	8.20 (1.42)	8.06 (1.37)	7.84 (1.65)	0.144
'When I look into a mirror, I see a good person.'	7.69 (1.73)	7.85 (1.62)	7.72 (1.75)	7.61 (1.79)	0.619
'I am proud of my roots and background'	8.23 (1.64)	8.16 (1.70)	7.91 (1.88)	8.06 (2.00)	0.307
GAD7 score (mean, SD)	2.22 (3.20)	1.79 (2.59)	2.05 (2.71)	2.04 (3.01)	0.502
GAD7 score categories					0.581
<10	219 (96.9%)	201 (97.6%)	180 (98.9%)	138 (97.2%)	
≥10	7 (3.1%)	5 (2.4%)	2 (1.1%)	4 (2.8%)	
Sexual health					0.070
Frequency of erections					
Never	12 (4.4%)	9 (4.0%)	6 (3.01%)	10 (6.1%)	
Once a month	39 (14.4%)	23 (10.1%)	28 (14.4%)	15 (9.20%)	
2–3 times a month	34 (12.6%)	29 (12.8%)	32 (16.5%)	38 (23.3%)	
Once a week	59 (21.9%)	48 (21.1%)	40 (20.6%)	39 (23.9%)	
≥2 times a week	126 (46.7%)	118 (52.0%)	88 (45.4%)	61 (37.4%)	
Problems with sexual intercourse					0.933
No	238 (87.8%)	203 (88.3%)	171 (88.1%)	150 (89.8%)	
Yes	33 (12.2%)	27 (11.7%)	23 (11.9%)	17 (10.2%)	
How often do you have thoughts of sex intercourse?					0.298
Never	3 (1.1%)	3 (1.3%)	0 (0.00%)	4 (2.4%)	
Once a month	5 (1.8%)	5 (2.2%)	3 (1.6%)	2 (1.2%)	
Once a week	24 (8.82%)	29 (12.8%)	25 (13.0%)	16 (9.70%)	
2–3 times a week	103 (37.9%)	71 (31.3%)	79 (40.9%)	70 (42.4%)	

Continued



Table 2 Continued

	Without AGA N=280†	Mild AGA N=235†	Moderate AGA N=201†	Severe AGA N=169†	P value*
Daily	137 (50.4%)	119 (52.4%)	86 (44.6%)	73 (44.2%)	
Frequency of sexual intercourse					0.751
Never	3 (1.12%)	3 (1.32%)	3 (1.55%)	4 (2.44%)	
Once a month	26 (9.70%)	18 (7.89%)	23 (11.9%)	20 (12.2%)	
Once a week	104 (38.8%)	81 (35.5%)	81 (42.0%)	66 (40.2%)	
2–3 times a week	123 (45.9%)	115 (50.4%)	80 (41.5%)	67 (40.9%)	
Daily	12 (4.5%)	11 (4.8%)	6 (3.1%)	7 (4.3%)	
GHQ12 score categories					0.808
0–2	229 (85.1%)	194 (85.8%)	161 (84.3%)	144 (87.8%)	
≥3	40 (14.9%)	32 (14.2%)	30 (15.7%)	20 (12.2%)	
Self-reported depression					0.364
No	253 (93.7%)	207 (90.8%)	181 (92.8%)	159 (95.2%)	
Yes	17 (6.3%)	21 (9.2%)	14 (7.2%)	8 (4.8%)	

Data are presented as n (%) unless otherwise specified.

\*P value was calculated by using Pearson's  $\chi^2$  test or analysis of variance.

†There is some missing data because all study cases did not answer to the questionnaires or denied the use of data afterwards.

BDI II, Beck Depression Inventory version II; 15D HRQoL, 15D instrument of health-related quality of life; GAD7, Generalised Anxiety Disorder 7-item instrument; GHQ12, 12-item General Health Questionnaire; HSCL25, the 25-item Hopkins Symptoms Checklist.

in subjects with AGA when compared with those without AGA in a multicentre study performed in Korea (n=998).<sup>14</sup> This finding was confirmed by an Indian study of 200 men with AGA; in that study QoL was inversely correlated with AGA severity.<sup>8</sup> However, those studies may have been subject to bias through their use of selected populations (collected from dermatology clinics or trichology clinics). It is very likely that those seeking help for hair loss might have had difficulties in accepting changes in their appearance, and consequently, might have had an elevated risk of associated psychosocial symptoms.

In the present study, psychosocial well-being was evaluated from diverse viewpoints by using comprehensive, previously standardised questionnaires. The study by Tas *et al* employed a partially comparable psychological test battery.<sup>10</sup> That study found that psychosocial symptoms increased with the severity of hair loss, but it addressed only severity of hair loss and failed to address differences between subjects with normal hair status and those with AGA. A comprehensive battery of psychological measurements was also used in the study by Cash.<sup>6</sup> They reported that hair loss is an unwanted and distressing experience.<sup>6</sup> However, the subjects were recruited to the study through barber shops and hair salons, which may have led to selection bias. The study by Gupta *et al*, which used the widely known and standardised Dermatology Life Quality Index, found life satisfaction to be lower in subjects with hair loss,<sup>8</sup> but in the context of their cohort, study cases were recruited from a dermatology clinic which can be considered unrepresentative of the general population.

One explanation for how our results diverge from those of previous studies could be methodological differences. A large study of 1707 men aged 18–40 years conducted in four countries (France, Germany, Italy and the UK) reported that hair loss had a significant negative effect on many aspects of the subjects' lives, including diminished life satisfaction, a greater degree of bother and more concern about growing older.<sup>7</sup> However, this study used questionnaires that were specifically concerned with hair loss. In turn, our study had no such direct link to hair loss, which likely made for a more objective evaluation (questionnaires were part of the 46-year collection of birth cohort). Another, smaller study similarly hid the purpose of data collection from the subjects.<sup>13</sup> In that study, investigators reported that the increasing degree of hair loss was associated, for example, with low self-esteem and depression.<sup>13</sup> However, a lack of detailed description of the methods of data collection, coupled with incomplete clarity regarding the sample size<sup>13</sup> make it difficult to compare that study with ours.

The main strength of our study was the coverage of a wide general population. To the best of our knowledge, the relationship between AGA and psychosocial well-being has not previously been studied in such large and unselected population. The participation rate was satisfactory good (60.9%) which is highly comparable with the participation rates in other cross-sectional European health examination surveys.<sup>32 33</sup> Another major strength of the study is that AGA was diagnosed and classified by dermatologists, who have optimal ability to differentiate AGA from other conditions that cause hair loss. Many



previous studies have used self-evaluation in grading hair loss, a method that can easily lead to underestimation. It is also noteworthy that our study subjects were not asked to commit to the this study because of their hair loss; this markedly differentiates our study from many previous studies of AGA.<sup>5 7 14 34</sup> We admit some limitations of the present study. Our study subjects represent only a Caucasian middle-age population at the of 46 years and thus our findings cannot be generalised to other age groups, such as younger males, in whom AGA is even more likely to be associated with psychosocial problems.<sup>11 13 14</sup> Since our study was not longitudinal, it does not exclude the possibility of developing these symptoms, perhaps with greater cumulative exposure to AGA, over time. It is also possible that men in our study have already tended to come to terms with their AGA. Furthermore, as another limitation we admit that not all invited cohort members participated in the study, which may have led to some bias. In the 46-year follow-up study, participants were more often employed and from higher social class, more likely married and with children when compared with non-participants.<sup>33</sup>

## Conclusions

AGA affects most men at some point in adult life. Thus, it is not surprising that the relationship between AGA and well-being has been widely studied. However, selection bias may have led previous studies to offer a flawed impression of this phenomenon. We found that AGA was not associated with psychosocial problems at the age of 46 years. However, more population-based studies are needed to confirm our finding. It would be especially interesting to see studies of similar design among younger males with AGA.

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**Contributors** S-PS, LH, JJ and MT were involved in the study conception and design. S-PS and LH provided study materials and collated data. All authors were involved in analysis and interpretation of the data. JJ provided statistical expertise. S-PS drafted the manuscript. LH, JA and MT revised it critically for important intellectual content. All authors approved the final version. S-PS and LH are the guarantors.

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**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not applicable.

**Ethics approval** This study involves human participants and was approved by The Ethical Committee of the Northern Ostrobothnia Hospital District approved the study (§94/2011), which was performed according to the principles of the Helsinki Declaration of 1983. The participants took part on a voluntary basis and signed their informed consent. The data were handled on a group level only, personal

information being replaced by identification codes resulting in complete anonymity. Participants gave informed consent to participate in the study before taking part.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available in a public, open access repository. The data that support the findings of this study are available from Northern Finland Birth Cohort 1966 Study. Restrictions apply to the availability of these data, which were used under license for this study. Data are available at <http://www.oulu.fi/nfbc/node/44315> with the permission of Northern Finland Birth Cohort.

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## REFERENCES

- Severi G, Sinclair R, Hopper JL, *et al.* Androgenetic alopecia in men aged 40–69 years: prevalence and risk factors. *Br J Dermatol* 2003;149:1207–13.
- Hamilton JB. Patterned loss of hair in man; types and incidence. *Ann N Y Acad Sci* 1951;53:708–28.
- Lolli F, Pallotti F, Rossi A, *et al.* Androgenetic alopecia: a review. *Endocrine* 2017;57:9–17.
- Kelly Y, Blanco A, Tosti A. Androgenetic alopecia: an update of treatment options. *Drugs* 2016;76:1349–64.
- Camacho FM, García-Hernández M. Psychological features of androgenetic alopecia. *J Eur Acad Dermatol Venereol* 2002;16:476–80.
- Cash TF. The psychosocial consequences of androgenetic alopecia: a review of the research literature. *Br J Dermatol* 1999;141:398–405.
- Budd D, Himmelberger D, Rhodes T, *et al.* The effects of hair loss in European men: a survey in four countries. *Eur J Dermatol* 2000;10:122–7.
- Gupta S, Goyal I, Mahendra A. Quality of life assessment in patients with androgenetic alopecia. *Int J Trichology* 2019;11:147.
- Williamson D, Gonzalez M, Finlay AY. The effect of hair loss on quality of life. *J Eur Acad Dermatol Venereol* 2001;15:137–9.
- Tas B, Kulacaoglu F, Belli H, *et al.* The tendency towards the development of psychosexual disorders in androgenetic alopecia according to the different stages of hair loss: a cross-sectional study. *An Bras Dermatol* 2018;93:185–90.
- Marks DH, Penzi LR, Ibler E, *et al.* The medical and psychosocial associations of alopecia: recognizing hair loss as more than a cosmetic concern. *Am J Clin Dermatol* 2019;20:195–200.
- Wang X, Xiong C, Zhang L, *et al.* Psychological assessment in 355 Chinese college students with androgenetic alopecia. *Medicine* 2018;97:e11315.
- Wells PA, Willmoth T, Russell RJ. Does fortune favour the bald? Psychological correlates of hair loss in males. *Br J Psychol* 1995;86:337–44.
- Han S-H, Byun J-W, Lee W-S, *et al.* Quality of life assessment in male patients with androgenetic alopecia: result of a prospective, multicenter study. *Ann Dermatol* 2012;24:311–8.
- Rantakallio P. Groups at risk in low birth weight infants and perinatal mortality. *Acta Paediatr Scand* 1969;193:Suppl 193.
- Sinikumpu S-P, Huilaja L, Jokelainen J, *et al.* High prevalence of skin diseases and need for treatment in a middle-aged population. A northern Finland birth cohort 1966 study. *PLoS One* 2014;9:e99533.
- Norwood OT. Male pattern baldness: classification and incidence. *South Med J* 1975;68:1359–65.
- Mattisson C, Bogren M, Horstmann V. Correspondence between clinical diagnoses of depressive and anxiety disorders and diagnostic screening via the Hopkins symptom check list-25 in the Lundby study. *Nord J Psychiatry* 2013;67:204–13.
- Veijola J, Jokelainen J, Läsky K, *et al.* The Hopkins symptom checklist-25 in screening DSM-III-R axis-I disorders. *Nord J Psychiatry* 2003;57:119–23.
- Derogatis LR, Lipman RS, Covi L. SCL-90: an outpatient psychiatric rating scale—preliminary report. *Psychopharmacol Bull* 1973;9:13–28.
- Sandanger I, Moum T, Ingebrigtsen G, *et al.* Concordance between symptom screening and diagnostic procedure: the Hopkins symptom

- checklist-25 and the composite international diagnostic interview I. *Soc Psychiatry Psychiatr Epidemiol* 1998;33:345–54.
- 22 Sandanger I, Moum T, Ingebrigtsen G, *et al.* The meaning and significance of caseness: the Hopkins symptom checklist-25 and the composite international diagnostic interview. II. *Soc Psychiatry Psychiatr Epidemiol* 1999;34:53–9.
  - 23 Beck AT, Ward CH, Mendelson M, *et al.* An inventory for measuring depression. *Arch Gen Psychiatry* 1961;4:561–71.
  - 24 Steer RA, Ball R, Ranieri WF, *et al.* Dimensions of the beck depression inventory-II in clinically depressed outpatients. *J Clin Psychol* 1999;55:117–28.
  - 25 Lecrubier Y, Weiller E, Hergueta T. *Mini international neuropsychiatric interview mini international neuropsychiatric interview*, 1992.
  - 26 Spitzer RL, Kroenke K, Williams JBW, *et al.* A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med* 2006;166:1092–7.
  - 27 Sintonen H, Pekurinen M. A fifteen-dimensional measure of health-related quality of life (15D) and its applications. In: *Quality of life assessment: key issues in the 1990s*. Springer, 1993: 185–95.
  - 28 Sintonen H. The 15D instrument of health-related quality of life: properties and applications. *Ann Med* 2001;33:328–36.
  - 29 Goldberg D, Williams P. *General health questionnaire (GHQ)*. Swindon, Wiltshire, UK: nferNelson, 2000.
  - 30 Goldberg DP, Gater R, Sartorius N, *et al.* The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med* 1997;27:191–7.
  - 31 Isohanni I, Järvelin MR, Rantakallio P, *et al.* Juvenile and early adulthood smoking and adult educational achievements—a 31-year follow-up of the Northern Finland 1966 Birth Cohort. *Scand J Public Health* 2001;29:87–95.
  - 32 Mindell JS, Giampaoli S, Goesswald A, *et al.* Sample selection, recruitment and participation rates in health examination surveys in Europe—experience from seven national surveys. *BMC Med Res Methodol* 2015;15:78–4.
  - 33 Tanja N, Jouko M, Juha A. Cohort profile: 46 years of follow-up of the Northern Finland birth cohort 1966 (NFBC1966). *Int J Epidemiol* 2021;1–12.
  - 34 Passchier J. Quality of life issues in male pattern hair loss. *Dermatology* 1998;197:217–8.