# Socioeconomic and health characteristics of people with alopecia(hair loss) after COVID-19 vaccination in South Korea

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Background

- According to the Korea Centers for Disease Control and Prevention, between 2021 and 2023, 1,544 cases of alopecia were recorded among 483,059 reported COVID-19 vaccination cases.
- Reports of alopecia as an adverse event have continued to emerge both domestically and internationally; however, there is a scarcity of largescale survey studies examining the risk of alopecia following COVID-19 vaccination. Most existing research is limited to analyses of a small number of cases.



# Results

#### Patterns of alopecia following COVID-19 vaccination

Participants who experienced alopecia showed **vulnerability factors** such as **younger** age (p < 0.001), lower education (p < 0.001), income levels (p < 0.01), rural residence (p < 0.01), employment in production, service, or sales jobs (p < 0.001), and parttime work (p < 0.01) compared to those who did not experience alopecia.

| Socio-de                   | mographic characteristics   | Total<br>(N=1153) | Alopecia-e<br>partie<br>(n= | experienced<br>cipants<br>:225) | Alope<br>partic<br>(n= | p      |       |
|----------------------------|---|-------------------|-----------------------------|---------------------------------|------------------------|--------|-------|
| Sex                        | Male  | 509               | 87                          | (17.1)                          | 422                    | (82.9) | 065   |
|                            | Female  | 644               | 138                         | (21.4)                          | 506                    | (78.6) | .005  |
| Agegroup                   | (years)   | 46.65±12.54       | 45.14                       | i±13.00                         | 47.02                  | ±12.41 | .043  |
|                            | 10-19   | 149               | 39                          | (26.2)                          | 110                    | (73.8) |       |
|                            | 20-29   | 207               | 38                          | (18.4)                          | 169                    | (81.6) |       |
|                            | 30-39   | 232               | 51                          | (22.0)                          | 181                    | (78.0) | < 001 |
|                            | 40-49   | 301               | 65                          | (21.6)                          | 236                    | (78.4) | <.001 |
|                            | 50-59   | 260               | 28                          | (10.8)                          | 232                    | (89.2) |       |
|                            | 60-69   | 4                 | 4                           | (100.0)                         | 0                      | (0)    |       |
| Education                  | Middle-school graduate  | 17                | 11                          | (64.7)                          | 6                      | (35.3) |       |
| level                      | High-school graduate  | 236               | 66                          | (28.0)                          | 170                    | (72.0) | <001  |
|                            | College/University graduate   | 772               | 131                         | (17.0)                          | 641                    | (83.0) |       |
|                            | Graduate school graduate  | 128               | 17                          | (13.3)                          | 111                    | (86.7) |       |
| Household                  | 100 <income< td=""><td>46</td><td>13</td><td>(28.3)</td><td>33</td><td>(71.7)</td><td></td></income<> | 46                | 13                          | (28.3)                          | 33                     | (71.7) |       |
| income                     | 100≤income<300  | 310               | 77                          | (24.8)                          | 233                    | (75.2) | 006   |
| (10,000 Won, per<br>month) | 300≤income<500  | 332               | 62                          | (18.7)                          | 270                    | (81.3) |       |
| inona y                    | 500≤income  | 465               | 73                          | (15.7)                          | 392                    | (84.3) |       |

| Socio-c         | lemographic characteristics                           | Total<br>(N=1153) | Alopecia-e<br>partic<br>(n= | cia-free<br>cipants<br>=928) | p   |        |       |
|-----------------|---|-------------------|-----------------------------|------------------------------|-----|--------|-------|
| Residence area  | Metropolitan area                                     | 758               | 150                         | (19.8)                       | 608 | (80.2) |       |
| Residence al ca | Small and medium-sized cities                         | 342               | 56                          | (16.4)                       | 286 | (83.6) | .004  |
|                 | Rural areas   | 53                | 19                          | (35.8)                       | 34  | (64.2) |       |
| Occupation      | Production jobs                                       | 63                | 21                          | (33.3)                       | 42  | (66.7) |       |
| occupation      | Office jobs   | 494               | 66                          | (13.4)                       | 428 | (86.6) |       |
|                 | Service and sales jobs                                | 170               | 47                          | (27.6)                       | 123 | (72.4) |       |
|                 | Health and medical jobs                               | 43                | 8                           | (18.6)                       | 35  | (81.4) | <.001 |
|                 | Housewife   | 214               | 46                          | (21.5)                       | 168 | (78.5) |       |
|                 | Others (unemployed, military service, students, etc.) | 169               | 37                          | (21.9)                       | 132 | (78.1) |       |
| Type of         | Full-time   | 672               | 112                         | (16.7)                       | 560 | (83.3) |       |
| employment      | Part-time   | 98                | 30                          | (30.6)                       | 68  | (69.4) | .001  |

Korea Disease Control and **Prevention Agency** 



#### Objectives

• This study aimed to identify patterns of alopecia following COVID-19 vaccination and to examine health-related characteristics associated with post-vaccination adverse events in South Korea.

# Methods

# Study design

- Cross-sectional self-reported online questionnaire-based survey
  - $\checkmark$  The questionnaire was finalized through expert validity testing and a preliminary pilot test.



#### **Participants**

• A total of 1,153 Korean adults - 225 individuals who experienced alopecia after

Pross-tabulation analyses, and independent sample t-tests were conducted

- Among those who experienced alopecia, the most common cases were those who experienced alopecia after the second dose of the COVID-19 vaccine (59.6%), those who experienced alopecia between one to three months after vaccination (35.1%), and those whose post-vaccine alopecia **lasted for more than six months** (44.9%).
- Compared to those without alopecia experience, those who experienced alopecia had more cases of COVID-19 infections (p < 0.001) and fewer vaccine doses administered (p < 0.001).

|   | n (%) or r  | nean±standard deviation                         |   |   |                       | 1  |                                   | n (%)                             |   |                  |                   | i  |                                   | n (%)    |
|---|---|---|---|---|-----------------------|--|-----------------------------------|-----------------------------------|---|------------------|-------------------|--|-----------------------------------|----------|
| Experience of alopecia after   Fiming of alopecia After 1st   experienceby After 2m   /accination dose* After 3rc   Fiming of alopecia Within 8   onset after Within 8   /accination* More that   More that 3 monthe   /accination of alopecia More that   Duration of alopecia Less that   More that 3 monthe   More that More that   More that More that< | pecia after COVID-19 vaccination                              | Alopecia-experienced<br>participants<br>(n=225) | Characteristic<br>vaccine-rela                  | Characteristics of COVID-19<br>vaccine-related infections |                       | Alopecia-<br>experienced<br>participants | Alopecia-<br>free<br>participants | p                                 | Characteristics of COVID-19<br>vaccine-related infections |                  | Total<br>(N=1153) | Alopecia-<br>experienced<br>participants | Alopecia-<br>free<br>participants | p        |
| Timing of alopecia  | After 1st dose  | 127 (56.4)                                      |   |   |                       | (n=225)                                  | (n=928)                           |                                   |   |                  |                   | (n=225)                                  | (n=928)                           |          |
| experienceby  | After 2nd dose  | 134 <b>(59.6)</b>                               | Infection of                                    | Yes   | 769                   | 156 (20.3)                               | 613 (797)                         |                                   | Number of   | 1                | 691               | 125 (18.1)                               | 566 (81.9)                        |          |
| vaccillation dose   | After 3rd dose  | 71 (31.6)                                       | COVID-19  | 165   | /05                   | 130 (20.3)                               | 010 (75.7)                        | .349                              | infections of   | 2                | 70                | 28 (40.0)                                | 42 (60.0)                         | <.001    |
| Experience of alop<br>Timing of alopecia<br>experienceby<br>vaccination dose*<br>Timing of alopecia<br>onset after<br>vaccination*  | After 4th dose  | 10 (4.4)  |   | No  | 384                   | 69 (18.0)                                | 315 (82.0)                        |                                   | COVID-19  | 3≤               | 8                 | 3 (37.5)                                 | 5 (62.5)                          |          |
| Timing of alopecia  | Within 8 days post-vaccination                                | 45 (20.0)                                       |   |   |                       | Cross-tabul                              | lationanalyseswere.co             | onducted.                         |   |                  |                   | Cross-tabu                               | ulationanalyseswered              | onducted |
| Experience of alopecia after   Timing of alopecia   experienceby   vaccination dose*   After   After   After   After   After   After   After   After   More f   month   More f   amonth   More  | More than 8 days but less than 1 month post-vaccination       | 68 (30.2)                                       |   |   |                       |  |                                   |                                   |   |                  |                   | n (%) or m                               | ean±standard de                   | viation  |
|   | More than 1 month but less than 3 months post-vaccination     | 79 <b>(35.1)</b>                                | Characteristic                                  | ed symptoms*  | Total                 |  | Alope                             | cia-experienced<br>Recovery outco | participants (n=<br>mes                                   | =225)            |                   |  |                                   |          |
|   | More than 3 months but less<br>than 6 months post-vaccination | 40 (17.8)                                       |   | ed symptoms   |                       | re                                       | No<br>recovery                    | Partial<br>recovery               | Cor<br>rec  | nplete<br>covery | (weeks)           | erioa                                    |                                   |          |
|   | More than 6 months post-<br>vaccination                       | 34 (15.1)                                       | Worsening of hair loss cor                      | iagnosed  | 76 (33.8)             | 1  | 9 (8.0)                           | 45 (20.0)                         | 12  | (5.3)            | 30.17±17.36       |  |                                   |          |
| Duration of alopecia  | Less than 1 month   | 26 (11.6)                                       | Scalp disorders (redness, itching, increased da |   |                       |  | 72 (22.0)                         | 1                                 | 10 (F 0)  | (E (20.0)        | 17                | (6.2)                                    | 10 07+7 76                        |          |
|   | More than 1 month but less than                               | /3 (19.1)                                       | etc.)   |   |                       |  | 72 (32.0)                         | 1                                 | 5 (5.0)   | 45 (20.0)        | 14                | (0.2)                                    | 10.07±7.70                        |          |
|   | 3 months  |   | Skin conditi                                    | ons on non-sca  | scalp areas (itching, |  | 39 (173)                          |                                   | 8 (36)  | 22 (9.8)         | 9                 | (40)                                     | 689±724                           |          |
|   | More than 3 months but less                                   | 35 (15.6)                                       | erythema, e                                     | tc.)  |                       |  | 33 (17.3)                         |                                   | 0 (0.0)   | 22 (3.6)         | 3                 | (1.0)                                    | 0.03=7.21                         |          |
|   | than 6 months   | · · ·   | Increase in gray hair                           |   |                       |  | 77 (34.2)                         | 4                                 | 0 (17.8)  | 35 (15.6)        | 2                 | (0.9)                                    | 26.00±31.11                       |          |
|   | More than 6 months  | 101 <b>(44.9)</b>                               |   | Tot   | al**                  |  | 180                               | 3                                 | 5 (19.4)  | 118 (65.6        | ) 27              | (15.0)                                   | -                                 |          |
|   | Unknown   | 20 (8.9)  | *Multiple re                                    | sponses allowe  | ed **If multiple      | responses are                            | selected, only ca                 | ses wher                          | e all symptoms  | are fully recov  | vered are class   | sified as comple                         | ete recovery, and                 | only     |
| *Multiple responses   | allowed   |   | cases where                                     | none of the sy  | ymptoms reco          | vered are classi                         | ified as no recove                | ery. Prop                         | ortions were ca   | Iculated for a t | otal of 180 in    | dividuals.                               |                                   |          |

### Health-related characteristics associated with post-vaccination adverse events

COVID-19 vaccination and 928 individuals who did not have alopecia as a comparison group

#### Measures

- Sociodemographic characteristics (sex, age group, occupation, education level, household income, residence area, family history)
- Experiences of alopecia symptoms(types, severity, period, recovery)
- **COVID-19-related characteristics**(vaccine type, infection)
- Health-related characteristics (underlying diseases, health status, lifestyle, and mental health)

## Analysis

- All data were analyzed using IBM SPSS Statistics 27.0
  - $\checkmark$  Descriptive statistics, cross-tabulation analyses, and independent sample t-tests were conducted to identify the patterns of alopecia symptom onset and to analyze the association between alopecia experience and health-related characteristics.
  - ✓ Logistic regression analyses assessed the association between experiences of alopecia symptoms and health-related characteristics controlled by sociodemographic factors including sex, age group, occupation, education level, household income, residence area, family history of alopecia

#### Conclusion

• This study identified the characteristics of alopecia symptom patterns after COVID-

## 1) Underlying diseases at the time of COVID-19 vaccination

- Compared to non-experiencers, those who experienced alopecia had **more cases of** alopecia diagnosed as a result of vaccination (p < 0.001).
- Those with underlying alopecia areata had the highest risk compared to the comparison group (OR=51.06, 95% CI: 21.31-122.37).

|   |  |                       |                        |              | 2             |   | N=1135 (Alopecia-experience   | ced participants n=         | =225, Alopecia         | -tree p   | oarticipants r      | 1=910   |
|---|--|-----------------------|------------------------|--------------|---------------|---|---|-----------------------------|------------------------|-----------|---------------------|---|
| History of diagnosed underlying diseases (I                                 |  | Tabal                 | Alopecia-              | Alopecia-    |               | Types   | variables   | Covaria                     | te-adjusted (          | )R* (9    | 95% CI)             |   |
|   |  | (N=1153) participants |                        | participants | p             | Severe conditions   | Hypertension  | 0.687                       | ( 0.406                | -         | 1.165               | )   |
|   |  |                       | (n=225)                | (n=928)      |               | (Def: Nene)   | Hyperlipidemia  | 1.503                       | ( 0.869                | -         | 2.598               | )   |
| Severe  | None   | 858                   | 162 (18.9)             | 696 (81.1)   | 355           | (Ref. None)   | Ischemic heart disease  | 9.439                       | ( 2.626                | -         | 33.933              | )<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)   |
| onaitions   | Yes*   | 295                   | 63 (21.4)              | 232 (78.6)   | .555          |   | Ctroko  | 0.000                       | ( 0.000                |           |                     | )   |
| History<br>evere N<br>onditions Y<br>lair loss and N<br>calp Y<br>onditions | Hypertension   | 194                   | 32 (16.5)              | 162 (83.5)   | .245          |   | Stroke  | 0.000                       | ( 0.000                | -         |                     | )   |
|   | Hyperlipidemia   | 138                   | 29 (21.0)              | 109 (79.0)   | .636          |   | Diabetes  | 1.242                       | ( 0.646                | -         | 2.390               | )   |
|   | Ischemic heart disease (myocardial infarction, angina) | 13                    | 7 <b>(53.8)</b>        | 6 (46.2)     | .002          |   | Cancer  | 2.138                       | ( 0.606                | -         | 7.544               | )   |
|   | Stroke   | 3                     | 0 (0)                  | 3 (100)      | .393          | Hair loss and scalp   | Alopecia areata   | 51.062                      | (21.307                | -         | 122.370             | )   |
|   | Diabetes   | 77                    | 20 (26.0)              | 57 (74.0)    | .139          | conditions  | Telogen effluvium   | 28 860                      | ( 12 491               | -         | 66 683              | )   |
|   | Cancer   | 14                    | 4 (28.6)               | 10 (71.4)    | .390          | (Ref: None)   | Constic bair locc   | 4 001                       | ( 1722                 | _         | 0 227               | )<br>)  |
| scalp   | None   | 934                   | 107 (11.5)             | 827 (88.5)   | <.001         |   |   | 4.001                       | ( 1./33                | -         | 9.237               | )   |
| conditions  |  | 219                   | F7 (90 1)              | 7 (10.0)     | < 001         |   | Seborrheic dermatitis   | 2.544                       | ( 1.371                | -         | 4.720               | )   |
|   | Alopecia areata  | 04<br>50              | 57 (89.1)<br>41 (82.0) | 9 (18.0)     | <.001         |   | Tinea capitis   | 2.053                       | ( 0.422                | -         | 9.992               | )   |
|   | Genetic hair loss***                                   |                       | 13 (27 1)              | 35 (72 9)    | 176           |   | Other hair loss conditions  | 8 800                       | ( 1769                 | -         | 43 764              | )   |
|   | Seborrheic dermatitis (scalp itching, flaking)         | 85                    | 30 <b>(35.3)</b>       | 55 (64.7)    | <.001         | Dermatological and  | Eczema, atopic dermatitis   | 1.397                       | ( 0.644                | -         | 3.031               | )   |
|   | Tinea capitis (fungal infection)                       | 9                     | 5 <b>(55.6)</b>        | 4 (44.4)     | .006          | auto-immune diseases  | Alleraies   | 1.278                       | ( 0.564                | -         | 2,896               | )   |
|   | Other hair loss conditions                             | 12                    | 9 <b>(75.0)</b>        | 3 (25.0)     | <.001         | (Ref: None)   | Inticaria and rashes  | 2 211                       | ( 158/                 | _         | 6018                | 33 )   33 )   333 )   333 )   30 )   30 )   30 )   30 )   370 )   583 )   377 )   20 )   32 )   37 )   30 )   31 )   36 )   36 )   10 )   558 )   530 ) |
| Dermatologi   | None   | 0                     | 0 (0)                  | 0 (0)        | _             |   |   | 5.511                       | ( 1.504                |           | (50//               | ,<br>,  |
| cal and   | Yes*   | 212                   | 60 (28.3)              | 152 (71.7)   |               |   | Vitiligo  | 4.467                       | ( 0.443                | -         | 45.044              | )   |
| immune  | Eczema, atopic dermatitis                              | 46                    | 14 (30.4)              | 32 (69.6)    | .056          |   | Psoriasis   | 0.938                       | ( 0.287                | -         | 3.065               | )   |
| diseases  | Allergies (food, drugs, pollen, etc.)                  | 51                    | 13 (25.5)              | 38 (74.5)    | .271          |   | Allergic rhinitis/asthma  | 0.630                       | ( 0.309                | -         | 1.286               | )   |
|   | Urticaria and rashes                                   | 40                    | 19 <b>(47.5)</b>       | 21 (52.5)    | <.001         |   | Hypothyroidism or hyporthyroidism                                     | 2 5 1 9                     |                        | _         | 7 210               | )   |
|   | Vitiligo   | 4                     | 1 (25.0)               | 3 (75.0)     | .782          |   |   | 2.310                       | ( 0.000                | -         | 7.210               | )   |
|   | Psoriasis  | 21                    | 6 (28.6)               | 15 (71.4)    | .291          |   | Autoimmune hemolytic anemia   | 0.000                       | ( 0.000                | -         |                     | )   |
|   | Allergic rhinitis/asthma                               | 86                    | 14 (16.3)              | /2 (83.7)    | .431          |   | Pernicious anemia   | 15.839                      | ( 2.399                | -         | 104.558             | )   |
|   | Autoimmuno homolytic anomio                            | 2U<br>2               | 9 (45.0)               |              | .004          |   | Other dermatological and  |                             |                        |           | • • • • •           |   |
|   | Pernicious anemia                                      | ے<br>و                | 6 <b>(75 0)</b>        | 2 (100)      | .480<br>< 001 |   | autoimmune diseases   | 6.819                       | ( 1.896                | -         | 24.530              | )   |
|   | Other dermatological and autoimmune                    | 12                    | 7 (58.3)               | 5 (41.7)     | .001          | This is the result of logistic regression<br>developed for each type of underlyin | n analysison the experience of alopecia after COVID-19 vaccination ac | ccording to underlying dise | ases at the time of va | accinatio | on, with regressior | Imodels   |

\*Multiple responses allowed. \*\*Refers to temporary, diffuse hair shedding followed by recovery. \*\*\*Refers to patterns such as thi

#### 2) Health status and lifestyle at the time of COVID-19 vaccination

- **Smokers** (OR=2.08, 95% CI: 1.24-3.49) and **overweight individuals** (OR=1.65, 95% CI: 1.07-2.54) had a higher risk of post-vaccination alopecia.
- Alopecia occurrence was more frequent among those with **insufficient sleep** duration (p<0.05).
- 19 vaccination and to examine factors associated with the occurrence of alopecia, such as socioeconomic vulnerability, presence of underlying conditions, insufficient sleep duration, smoking, being overweight, and anxiety or depression.
- These findings should be interpreted cautiously due to potential recall bias and subjective symptom assessment from the time gap between vaccination and the survey.
- The small number of participants with alopecia and differences in comparison group sizes may limit result generalizability, highlighting the need for more participants and future large-scale studies.
- Priorities for future vaccination and recovery projects can be discerned. Special consideration should be directed towards economically and socially disadvantaged groups, individuals with suboptimal lifestyle habits and mental health conditions, and those diagnosed with relevant medical conditions.
- Individuals with moderate to severe anxiety disorders also faced a heightened risk  $\bullet$ (OR=3.59, 95% CI: 2.06-6.25).

|                                 |                             |                     | n (%) or me      | ean±standard o   | deviation                   | N=1135 (Alopecia-experienced participants n=225, Alopecia-free participants n=910) |                             |                                 |          |       |       |       |       |   |
|---------------------------------|-----------------------------|---------------------|------------------|--|-----------------------------|--|-----------------------------|---------------------------------|----------|-------|-------|-------|-------|---|
|                                 |                             |                     |                  |  |                             |  | Variables                   | Covariate-adjusted OR* (95% CI) |          |       |       |       |       |   |
| Variables                       |                             | <b>T</b> I          | Alopecia-        | Alopecia-  |                             | Obesity  | Underweight                 | 1.067                           | (        | 0.534 | -     | 2.132 | )     |   |
|                                 |                             | 10tai<br>(NI-1153)  | experienced      | narticipants   | p                           | (Ref: Normal   | Overweight                  | 1.652                           | (        | 1.074 | -     | 2.542 | )     |   |
|                                 |                             | (11-1155)           | (n=225)          | (n=928)  |                             | weight)  | Obesity                     | 1.242                           | (        | 0.798 | -     | 1.932 | )     |   |
|                                 |                             |                     | ()               | (  |                             | Abdominal  |                             |                                 |          |       |       |       |       |   |
| Sleep                           | Regular sleep (points)      | 3.49±0.85           | 3.48±0.94        | 3.49±0.83  | .906                        | Obesity  | Abdominal obesity           | 0.676                           | (        | 0.363 | -     | 1.258 | )     |   |
|                                 | Sleep Duration              | 7.71±1.29           | 7.79±1.33        | 7.68±1.28  | .252                        | (Ref: Normal)  |                             |                                 |          |       |       |       |       |   |
|                                 | Adequate sleep time         | 587                 | 103 (17.5)       | 484 (82.5)   |                             |  | Borderline disorder         | 0.741                           | (        | 0.449 | -     | 1.222 | )     |   |
|                                 | Inadequate sleep time       | 566                 | 122 (21.6)       | 444 (78.4)   | .086                        | .086   | (Rel: Normal)               | Moderate to severe disorder     | 0.978    | (     | 0.619 | -     | 1.546 | ) |
| Anxiety and depression          |                             | 15 48+5 56          | 17 36±6 49       | 1502+522   | < 001                       | Anxiety  | Borderline disorder         | 2.399                           | (        | 1.582 | -     | 3.639 | )     |   |
|                                 |                             | 4 96+3 44           | 6 25+3 92        | 4 64+3 24  | < 001                       | (Ref: Normal)  | Moderate to severe disorder | 3.589                           | (        | 2.061 | -     | 6.250 | )     |   |
|                                 | Normal                      | 4.50±5.44           | 120 (157)        | 7/6 (0/ 2)   | <b>\.001</b>                | Physical Activity  | Insufficient                | 0.860                           | (        | 0.561 | -     | 1.317 | )     |   |
| Normal<br>Decidentine discustor | 000                         |                     | 740 (64.3)       |  | (Ref: Sufficient)           | Over sufficient  | 1.154                       | (                               | 0.754    | -     | 1.768 | )     |       |   |
|                                 | Borderline disorder         | 183                 | 52 <b>(28.4)</b> | 131 (71.6)   | <.001                       | <b>Dietary Habits</b>  | Borderline                  | 1.182                           | (        | 0.521 | -     | 2.682 | )     |   |
| Moderate to severe disorder     | 85                          | 85 34 <b>(40 0)</b> | 51 (60.0)        | 0) (Ref: Good) Risky<br>Smoking Quit less than 6 month | (Ref: Good)                 | Risky  | 1.004                       | (                               | 0.398    | -     | 2.532 | )     |       |   |
|                                 | 00                          | 34 (40.0)           |                  |  | Quit less than 6 months ago | 2.092  | (                           | 0.698                           | -        | 6.273 | )     |       |       |   |
|                                 | Depression (points)         | 10.52±3.53          | 11.11±3.78       | 10.38±3.45   | .005                        | (Ref: Non-smoker   | Quit more than 6 months ago | 1.542                           | (        | 0.909 | -     | 2.617 | )     |   |
|                                 | Normal                      | 225                 | 41 (18.2)        | 184 (81.8)   |                             |  | Smoker                      | 2.080                           | ````(    | 1.240 | -     | 3.488 | )     |   |
|                                 | Borderline disorder         | 353                 | 57 (16.1)        | 296 (83.9)   | 07/                         | Sleep  |                             |                                 | <u> </u> |       |       |       | ,     |   |
|                                 | Moderate to severe disorder | 575                 | 127 (22.1)       | 448 (77.9)   | .0/4                        | (Ref: Adequate<br>sleep)   | Inadequate sleep            | 1.215                           | (        | 0.872 | -     | 1.695 | )     |   |

Levels of anxiety and depression were measured using the HADS (Hospital Anxiety and Depressi each for anxiety and depression; higher scores indicate higher levels of anxiety and depression).

income, residence area, family history of alopecia, high-risk drinking status

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