Objective. Personality traits can affect humans’ mental health. In the present study, we aimed to assess the relation of loneliness to personality traits and also to inequality in socio-economic status in girls.

Methods. In a cross-sectional study, the relations of personality traits to loneliness in girls were investigated in Ilam during 2014 to 2015. A multistage cluster random sampling method was used to select the participants. The NEO-FFI and University of California, and Los Angeles questionnaires were used for data collection. Data were analyzed by IBM SPSS and Distributive Analysis Stata Package (DASP).

Results. Among 400 recruited participants, 149 (37.2%) were categorized as having loneliness. The concentration index (CI) for loneliness was 0.19 (95% confidence interval CI 0.07, 0.27), which indicated that loneliness was observed more in persons with high socioeconomic status. The risk of loneliness was 38% lower in persons with higher scores in neuroticism (adjusted odds ratio (AOR) = 0.62, 95% CI: 0.48, 0.91).

Conclusion. We found that socio-economic inequality was observed in relation to loneliness with girls of higher socioeconomic status reporting more loneliness. Therefore, more attention should be directed by policymakers to determining the main contributors to inequality and loneliness in high-income societies.
each class were sampled systematically. Among 409 selected participants 400 (97.7%) responded to the questionnaires. The inclusion criteria were female students with no history of known physical or mental disorders or with recent acute stress (during the prior six months).

The study was approved by the Psychosocial Injuries Research Center, Ilam University of Medical Sciences Ethics Committee, and informed consent was signed by all participants.

**Socio-economic status (SES)**

In current study, we have put participants in SES categories (low, middle, and high) by applying principal component analysis (PCA). The 4 items were enrolled to PCA to prediction of SES, including: family income, the educational level of parents (five levels: illiterate, primary school, high school, diploma, university), location of residence (urban/rural), occupation of parents. Therefore according to Friesen study in 2016 we used arbitrary cut-off points are classification of the lowest 40% of households into ‘poor’, the highest 20% as ‘rich’ and the rest as the ‘middle’ group. Eventually, we classified households into quintiles and calculated the mean socio-economic score for each group [14].

**Assessment tools**

The NEO-FFI and University of California and Los Angeles (UCLA) questionnaires were used for data collection. Also, the demographic portion of the questionnaire was created using scientific books and similar research and taking into consideration the social and cultural environment. The demographic questionnaire included age, education field and level of parents’ location, occupation, family income and educational level.

The NEO-FFI included 60 items which measure the students personality in five dimensions including: neuroticism (items: 1,6,11,16,21,26,31,36,41,46,51,56), extraversion (items: 2,7,12,17,22,27,32,37,42,47,52,57), openness to experience (items: 3,8,13,18,23,28,33,38,43,48,53,58), agreeableness (items: 4, 9,14,19, 24, 29, 34, 39, 44,49, 54, 59) and conscientiousness (items: 5,10,15,20,25,30,35,40, 45,50,55,60). The scores were: totally agree = 4, agree = 3, no comment = 2, disagree = 1 and strongly disagree = 0. The final score was obtained by summing the scores for all questions. The questionnaire scores ranged from 0 to 48 for each dimension. Based on the total score achieved for each dimension, participants were divided into one of three groups (less than 25% represented poor, 25%-75% moderate and more than 75% represented good condition) [15]. The UCLA questionnaire (1978): This questionnaire included 20 items and used a four distinct score scale to measure feelings of social isolation. The scores were: 1 = “I never feel this way”, 2 = “I rarely feel this way”, 3 = “I sometimes feel this way” and 4 = “I often feel this way”. The questionnaire consists of 11 positive and 9 negative items. All negative items including 1-5-6-9-10-15-16-19 and 20, were scored inversely [16]. The lowest total possible score is 20, which represented no loneliness and scores more than 80 represented severe loneliness [17].

**Statistical analysis**

Data analyses were conducted using IBM SPSS for Windows ver. 20.0 (IBM Co., Armonk, NY, USA). Descriptive and inferential statistics and the Distributive Analysis Stata Package (DASP) were used to obtain an inequality index (II) for loneliness. The amount of CI is obtained by a Concentration Curve (CC) in which the y-axis is the cumulative percentage of loneliness, and the x-axis is the cumulative percentage of the participants ranked by socioeconomic status. The value of II ranged from -1 to +1; the negative value indicated that the health variable is more concentrated in the poor population, and the positive value indicates more concentration in the rich population [18]. The x² test was used to test categorical variables. Univariate and multivariate logistic regression models were applied to compute Odds Ratios (OR) with 95% Confidence Intervals (95% CI). Confounding factors that were adjusted in multivariate logistic regression models were age, education field and level, parents’ educational level and parents ‘occupation, based on changing the effect by at least 10%. The Hosmer-Lemeshow statistic was evaluated for fit of the models, indicating well fit if the significance value was less than 0.05.

**Results**

Overall 400 girl students were recruited ranging in age from 14 to 18 years. Participants were in the first to third grade of high school students, with an equal distribution across grades. The mean ± SD scores in neuroticism, extraversion, and agreeableness traits were significantly higher in non-lonely persons, but no significant differences in loneliness were observed in relation to openness to experience and conscientiousness traits (Tab. I).

Inequality in loneliness by socioeconomic status was calculated using the II. The II for loneliness was 0.19 (95% CI 0.07, 0.27), which indicated a positive inequality in loneliness according to socioeconomic factors; therefore, loneliness was observed more in persons with a high socioeconomic status (Fig. 1).

In this study, multiple logistic regressions were conducted to examine the association between personality traits and loneliness in girl students (Tab. II). In our model, age and other socio-economic factors were covariates and adjusted. The odds of loneliness in girl students was 38% in those with a higher score for the neuroticism trait (adjusted odds ratio (AOR) = 0.62, 95% CI 0.48, 0.91). The odds of loneliness in persons with a higher score for the extraversion trait was lower (AOR) = 0.82, 95% CI 0.63, 0.91). Also, the odds of loneliness was lower for those with higher agreeableness trait (AOR) = 0.90, 95% CI 0.84, 0.96).

**Discussion**

In this study, we analyzed of the odds of loneliness by personality traits and socio-economic status in girl students. Some personality traits have shown significant associations with physical and mental human health [19, 20].
Our results showed that personality traits, including neuroticism, extraversion, and agreeableness, were significantly associated with loneliness when compared to girls assessed to be non-lonely, but we did not find significant associations of loneliness with the openness to experience and conscientiousness traits. The Mean ± SD of neuroticism trait scores in non-lonely and lonely girls were 26.25 ± 6.33 and 22.03 ± 6.54, respectively. This finding is in line with the results of other studies [20] that have demonstrated a strong correlation between neuroticism and mental health conditions, such as depressive symptoms, anxiety and mental disorder [20]. Also, one study has shown an increased risk of depression in Chinese women with neurotic personality [21].

In this study, inequality in loneliness by socioeconomic factors was calculated using the II. Loneliness was observed more in persons with a high socioeconomic status. The important reasons for inequality in loneliness by socioeconomic factors can be related to issues of illiteracy and low levels of literacy in Iranian women. Illiterate persons and families with low levels of literacy have lower income and less leisure time to spend with their family members. The Behrouzi et al. study (2015) found a significant relationship between family leisure time and family closeness in females [22].

In the present study, we adjusted for confounding factors and based on our results, the odds of loneliness in participants with higher scores for neuroticism, extraversion, and agreeableness trait were lower. Most participants (97%) had moderate flexibility. The basic question is why does openness increase the odds of loneliness among girls so much? We may identify the reason in coping strategies that individuals choose. Most coping strategies reflect individual effort, such as task-oriented coping, emotion-oriented coping and avoidance-oriented coping to improve difficult situations [23].

Some limitations should be mentioned that were present in this study. First, the socioeconomic-factors were limited to educational levels of participants and that of their parents, age, residence, and job of parents. This accounted for 62% of the variance. Second, significant relationships in this cross-sectional study should be interpreted with caution due to the concurrency in of variables assessed in this study so that the temporal relations of variables could not be determined.

In summary, we found that the odds of loneliness differed by personality traits and by socioeconomic status with loneliness observed more in persons with high socioeconomic status.

Acknowledgements

We thank our colleagues from Psychosocial Injuries Research Center of Ilam University of Medical Sciences that sponsored this project financially.

Funding sources: this research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Table I. The Mean ± SD scores of personality traits and its relationship with loneliness (non-lonely and lonely).

| Personality traits          | Non-lonely, N = 251 | Lonely, N = 149 | P-value  |
|-----------------------------|---------------------|-----------------|----------|
|                             | Mean    | SD    | Mean    | SD    |        |
| Neuroticism                 | 26.25   | 6.33  | 22.03   | 6.54  | <0.001 |
| Extraversion                | 16.75   | 5.18  | 14.68   | 5.06  | 0.008  |
| Openness to experience      | 21.21   | 4.21  | 21.23   | 4.62  | 0.256  |
| Agreeableness               | 23      | 4.65  | 21.74   | 3.75  | 0.011  |
| Conscientiousness           | 18.32   | 3.22  | 17.02   | 3.9   | 0.134  |

Table II. The result of multiple logistic regression analysis the association between type of personality and loneliness in girls students.

| Personality dimensions | Unadjusted OR (95% CI) | P-value* | Adjusted OR† (95% CI) | P-value‡ |
|------------------------|------------------------|----------|-----------------------|----------|
| Neuroticism            | 0.67(0.58-0.88)        | 0.035    | 0.62(0.48-0.91)       | 0.002    |
| Extraversion           | 0.85 (0.68-0.95)       | 0.007    | 0.82(0.63 - 0.91)     | 0.003    |
| Openness to experience | 0.97(0.91 - 1.06)      | 0.355    | 0.95 (0.90 - 1.03)    | 0.270    |
| Agreeableness          | 0.91(0.85 - 0.98)      | 0.005    | 0.90(0.84 - 0.96)     | 0.002    |
| Conscientiousness      | 0.96(0.89 - 1.10)      | 0.551    | 0.93(0.88 - 1.07)     | 0.232    |

*Calculated by univariate logistic regression analysis; †Adjusting for age, education field and level, parents’ educational level and parents’ occupation as confounding factors; ‡Calculated by multivariate logistic regression analysis the outcome variable was non-lonely and lonely groups.
Conflict of interest statement

The authors declare no conflict of interest.

Authors’ contributions

AD-M and YV carried out the study, participated in the analysis and manuscript drafting. AD-M participated in collecting the raw data. YV coordinated the study and participated in the analysis and manuscript drafting. All authors read and approved the final manuscript.

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Received on April 9, 2019. Accepted on January 10, 2020.

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How to cite this article: Direkvand-Moghadam A Hashemian A, Direkvand-Moghadam A, Veisani Y. Socio-economic inequality and risk of loneliness by personality traits in girl students. J Prev Med Hyg 2020;61:E21-E24. https://doi.org/10.15167/2421-4248/jpmh2020.61.1.1250

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