



RESEARCH ARTICLE

Psychological Distress Induces Poor Sleep Quality: A Cross-Sectional Study of Pharmacy Students in Bandung City, Indonesia

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Abstract:**Introduction:**

Poor subjective sleep quality in undergraduate students has not been widely studied in Bandung city, Indonesia. Poor sleep quality has been related to a number of risk factors for poor health outcomes.

Objective:

To analyze the association between psychological distress and subjective sleep quality.

Methods:

A cross sectional survey was done in one of the universities of Bandung city, Indonesia. Data were collected from 290 undergraduate students selected through consecutive sampling. Pittsburg Sleep Quality Index (PSQI) and Kessler-10 questionnaire were administered.

Results:

The prevalence of psychological distress was well (43.1%), mild (28.6%), moderate (20.7%), and severe (7.6%). The overall sleep quality was poor and good in 84.5% and 15.5% of the students. There was a significant association between psychological distress and poor sleep quality ($p=0.006$). The multivariate analysis suggested that psychological distress was a predictor of poor sleep quality (OR 1.991; 95% CI, 1.311–3.026).

Conclusion:

There is a need for an awareness of the college resources to help manage the stress levels of students through effective coping strategy-related study habits.

Keywords: Sleep quality, Psychological distress, Students, Kessler-10, Pittsburg Sleep Quality Index, Multivariate analysis.

1. INTRODUCTION

Insufficient sleep, including short duration, irregular sleep schedules, and reduced sleep quality are common among college students [1, 2]. Sleep acts as a buffer in the normal line of defense against stress and illness [3]. Previous studies have indicated that maintaining 7 to 8 hours of sleep is associated with the best health outcomes, whereas sleeping less or more is associated with poorer health status and increased risk of morbidity and mortality [4]. The quality of sleep is a measure of both the quantitative and qualitative components of sleep [5]. The quantitative component involves the

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duration of sleep whereas the qualitative component is a subjective measure of the depth and feeling of restfulness upon awakening [5].

Poor sleep quality has been closely related to mood disturbance and a number of risk factors for poor health outcomes [6], including high blood pressure, increased body mass index and depression [7]. Moreover, insomnia, poor sleep quality, and short sleep have been found to be correlated with high stress [8, 9]. A previous study showed that increased stress and reduced health-related quality of life were observed in the first 3 years of a PharmD curriculum [10]. Interestingly, the literature on stress and sleep deprivation indicates that there might be a bidirectional relationship between these two variables [11, 12].

The Pittsburg Sleep Quality Index (PSQI) is used for subjective assessment of sleep quality [5]. The Global Sleep Quality (GSQ) score is computed as the sum of response values for the seven components of the PSQI scale (sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping medication and daytime dysfunction) [5]. These instruments are used as general measures of sleep health and daytime dysfunction, and are not specific for any single primary sleep disorder. The PSQI has been widely translated and used in a wide range of both population-based and clinical studies [13, 14].

Very few studies have been conducted to explore the sleep quality of Indonesian undergraduate students. Most of these studies focused on sleep patterns and fatigue [15, 16]. Little is known about what factors contribute to poor sleep quality in this population. This study measures the association between psychological distress and poor sleep quality in a population of undergraduate students, and examines the factors that contribute to poor sleep quality.

2. METHODS

A cross-sectional survey was done in one of the universities of Bandung City, Indonesia. Assuming a prevalence rate of 32.5% [17] as the best estimate of poor sleep quality among undergraduate students, a minimum sample size of 290 would provide true values at 95% confidence interval (95% CI) level. Thus, data were collected from 290 undergraduate students.

This study was approved by the Universitas Padjadjaran Ethical Committee for Health Research (407/UN6.C1.3.2/KEPK/PN/2016). Informed consent was obtained from all undergraduate students after a full explanation of the purpose and procedures used for the study. All individuals who participated in this study signed informed consent forms (with anonymity and data confidentiality guaranteed), and all samples were taken in accordance with the Declaration of Helsinki [18].

The students were recruited by consecutive sampling to complete a self-administered questionnaire. They were asked to provide demographic information, such as age, gender, body weight, and height. In addition, they were required to report on their performance in college, such as their latest semester's cumulative Grade Point Average (cGPA).

The psychological distress levels were measured by the Kessler-10 [18]. The Kessler-10 is a measure of non-specific psychological distress experienced in the last 30 days, and is a reliable and valid indicator of current mental health status [19]. The psychological distress scores were grouped as follows well (0-20), mild (20-24), moderate (25-29) and severe (> 30) [20].

The PSQI is commonly used for the subjective assessment of sleep quality [5]. This instrument is a standardized quantitative measure of sleep quality with demonstrated high levels of consistency, reliability, and validity [5, 21]. The PSQI is a questionnaire consisting of 19 items that are coded on a 4-point scale (0-3) to obtain seven sub-categories, including sleep duration, sleep efficiency, sleep satisfaction, and medication use. The sum of all sub scores represents the total sleep quality score, ranging between 0 and 21, with higher scores representing lower sleep quality. The students were categorized as follows: good sleep quality (< 5) and poor sleep quality (≥ 5). The students completed the Indonesian version of the PSQI.

Height and weight were measured using the self-reported questionnaire. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared² (kg/m^2). The international classification of BMI was used. The principal cut-off points were categorized as follows: BMI ≥ 30 (obesity); BMI between 25 and 30 (overweight), BMI < 25 (normal weight), and BMI ≤ 18.5 (underweight) [22].

The descriptive results were expressed as frequency, percentage, and mean \pm standard deviation. Kolmogorov-Smirnov test was used to check for normal distribution. Pearson's χ^2 analysis was used to assess the differences in the

frequency distributions between variables. The statistical significance was set at $p < 0.05$. In the multivariate analysis, multinomial logistic regression was applied to investigate the associations between sleep quality and psychological distress while adjusting for demographics (age, gender and c GPA) and BMI.

3. RESULTS

A sample of 290 undergraduate students joined this study. Table 1 shows the socio-demographic information of the students. The students were predominantly female and ages 20 to 22 years old. Most students have normal BMI, are living alone, and receive tuition fee and life expenses from their parents. Two hundred forty-five students (84.5%) scored > 5 in the PSQI representing students with poor sleep quality, whereas 45 students (15.5%) scored ≤ 5 representing students with high sleep quality. There was a significant association between psychological distress and sleep quality ($p=0.006$).

Table 1. Socio-demographic and characteristics of students (n=290).

	Sleep Quality		p-value
	Poor	High	
N	245	45	–
Age (years)	–	–	0.142
<19	40 (91)	4 (9)	–
20-22	193 (84)	36 (16)	–
> 23	12 (71)	5 (29)	–
Gender	–	–	0.673
Male	62 (86)	10 (14)	–
Female	183 (84)	35 (16)	–
cGPA	–	–	0.690
2.00-2.50	4 (80)	1 (20)	–
2.51-3.00	45 (87)	7 (13)	–
3.01-3.50	139 (85)	25 (15)	–
3.51-4.00	20 (83)	4 (17)	–
BMI	–	–	0.642
Underweight	43 (86)	7 (14)	–
Normal	138 (83)	29 (17)	–
Overweight	61 (87)	9 (13)	–
Living Status	–	–	0.469
Alone	196 (85)	35 (15)	–
Parents	48 (84)	9 (16)	–
Tuition fee source	–	–	0.929
Scholarship	50 (85)	9 (15)	–
Parents	194 (84)	36 (16)	–
Life expenses	–	–	0.943
Scholarship	25 (81)	6 (19)	–
Parents	210 (84)	39 (16)	–
Psychological distress	–	–	0.006
Well	95 (76)	30 (24)	–
Mild	74 (89)	9 (11)	–
Moderate	55 (92)	5 (8)	–
Severe	21 (95)	1 (5)	–

The prevalence of psychological distress was well (43.1%), mild (28.6%), moderate (20.7%), and severe (7.6%). The overall sleep quality was poor and good in 84.5% and 15.5% of the students, respectively (Fig. 1).

The multivariable-adjusted Odds Ratios (ORs) of psychological distress for the sleep quality are presented in Table 2. There was an increased likelihood of poor sleep quality score for those students with psychological distress (OR, 1.991; 95% C.I. 1.311 – 3.026).

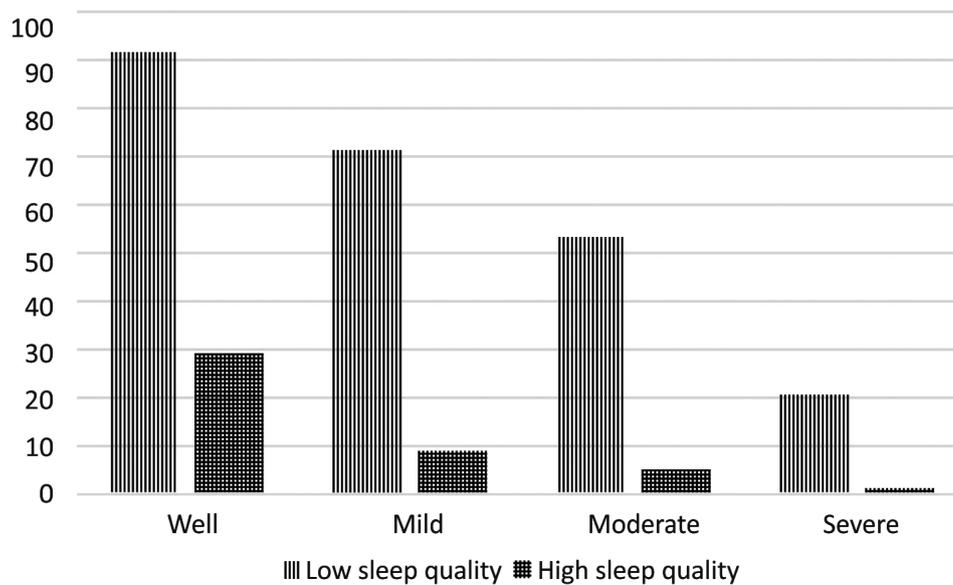


Fig. (1). The overall sleep quality of the students.

Table 2. Multinomial logistic regression result for predictors of quality of sleep.

Parameter	SE	Sig.	OR adjusted (95% CI)
Intercept	3.031	0.118	0.855(0.675-1.083)
Age	0.121	0.195	0.654 (0.295-1.448)
Gender	0.406	0.295	1.039 (0.455-2.374)
BMI	0.267	0.992	1.003 (0.594-1.692)
Living status	0.422	0.928	1.039 (0.455-2.374)
Tuition fee source	0.466	0.806	1.121 (0.450-2.7960)
Life expenses	0.465	0.539	0.752 (0.302-1.870)
Psychological distress	0.213	0.001	1.991 (1.311-3.026)

4. DISCUSSION

The prevalence of poor sleep quality among the students in this study is 84.5%. This is much higher than the results of Suen [23] in the United States, who reported 42% and the findings of James [17] at a Nigerian University with 32.5%. The high rate of poor sleep quality in this study might also be due to the fact that the students took an exam afterwards. This is in concordance with the finding that academic schedules play an important role in the sleep disturbance of college students [24].

There was no significant association between sociodemographic information and BMI and sleep quality. This result is similar to the finding of previous studies among Malaysian tertiary students [25] and Estonian medical students [26]. However, the result of this study is in contrast with the finding of Pearson *et al.*, who found that obese patients have sleep difficulties [27]. Further, the association of sleep quality with obesity was modified by perceived stress [28]. The finding of this study might be due to the homogeneity of the students' BMI.

After multivariable adjustment, students with psychological distress had increased odds of reporting poor sleep quality (OR, 1.991; 95% CI, 1.311 – 3.026). Students with psychological distress were found to be 1.991 times more likely to have poor sleep quality compared to students without psychological distress. This result is in concordance with that of a previous study indicating that a higher global perceived stress is associated with poor sleep quality ($r = 0.36$) [6]. In addition, a high degree of depression and anxiety was found to be the influencing factor of poor sleep quality among Chinese adolescents [29].

The effects of sleep disturbances in college students are substantial, such as an increased risk of mental illness [30], impaired social relationships [31], and reduced academic performance [32]. In a previous study of a large population of college students, students with poor sleep quality reported significantly more problems of physical and psychological health than did students with good sleep quality [1]. In addition, sleep deprivation has several adverse physiological consequences, including impaired glucose tolerance and insulin sensitivity, elevated sympathetic tone, increased

inflammation, and the increase of ghrelin and decrease of leptin with the subsequent increase of hunger and appetite [1].

Psychological distress can serve as a predisposing, precipitating, and perpetuating factor of sleep difficulties in this population. First, college lifestyle creates precipitating factors that enhance stress-related sleeping difficulties (e.g., erratic schedules and high-stress periods such as final exams). Second, the students may be more susceptible to hyperarousal-related sleep difficulties because of the maturational changes in the neuroendocrine system. Third, college students may have not yet developed sufficient strategies for handling stressful events and subsequently may experience more internalizing and worry [33]. Moreover, previous study showed that DNA methyltransferase 3A gene polymorphism contributes to daily life stress susceptibility among Indonesian healthy subject [34]. Thus, biological factors may provide a predisposition for stress-induced sleep difficulties. Common stressful events in this population (e.g., midterm examinations and relationship troubles) and worry can accelerate sleep difficulties [1].

The current pharmacy curriculum emphasizes the importance of time and self-management skills due to the overload of the academic course (assignments, laboratories, presentations, and examination). According to the Accreditation Council for Pharmacy Education (ACPE), colleges and schools of pharmacy should actively investigate the students' levels of stress [35]. Such analyses can be used in various stress management programs that could result in the elimination of certain stress-causing activities, possibly improving the students' overall health and academic performance. Only a few colleges and schools of pharmacy have published findings on student stress, especially from a 4-year PharmD curriculum [36]. This finding may provide us the motivation needed to modify the curriculum to reduce psychological stress among college students.

This study had several limitations. First, the generalizability of this study may be limited since the study sample represented only for the selected student population. The subsequent studies should include a larger and more diverse group of students to ensure generalizability. Second, our data relied on the students' self-reported data and may have contained recall bias. In addition, there was no objective sleep assessment using polysomnography or actigraphy devices or stress symptoms collected clinically. However, the Kessler-10 and the PSQI are both validated measures and the most widely used self-reported measures of the psychological distress and sleep quality. Thus, it is unlikely that our estimates are seriously underestimated.

CONCLUSION

A large proportion of college students in one of the universities in Bandung City, Indonesia have poor sleep quality that is associated with psychological distress. There is a need for an awareness of the college resources and curriculum to help manage the stress levels of students through effective coping strategy-related study habits, time management, and self-management.

LIST OF ABBREVIATIONS

BMI	=	Body Mass Index
cGPA	=	cumulative Grade Point Average
OR	=	Odds Ratio
PSQI	=	The Pittsburg Quality Index

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Universitas Padjadjaran Ethical Committee for Health Research (407/UN6.C1.3.2/KEPK/PN/2016).

HUMAN AND ANIMAL RIGHTS

No Animals were used in this research. All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2008.

CONSENT FOR PUBLICATION

Written informed consent for publication was obtained from all participants.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest, financial or otherwise.

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REFERENCES

- [1] Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep patterns and predictors of disturbed sleep in a large population of college students. *J Adolesc Health* 2010; 46(2): 124-32.
[<http://dx.doi.org/10.1016/j.jadohealth.2009.06.016>] [PMID: 20113918]
- [2] Vargas PA, Flores M, Robles E. Sleep quality and body mass index in college students: the role of sleep disturbances. *J Am Coll Health* 2014; 62(8): 534-41.
[<http://dx.doi.org/10.1080/07448481.2014.933344>] [PMID: 24933244]
- [3] Shao M-F, Chou Y-C, Yeh M-Y, Tzeng W-C. Sleep quality and quality of life in female shift-working nurses. *J Adv Nurs* 2010; 66(7): 1565-72.
[<http://dx.doi.org/10.1111/j.1365-2648.2010.05300.x>] [PMID: 20492021]
- [4] Fernandez-Mendoza J, Calhoun S, Bixler EO, *et al.* Insomnia with objective short sleep duration is associated with deficits in neuropsychological performance: A general population study. *Sleep* 2010; 33(4): 459-65.
[<http://dx.doi.org/10.1093/sleep/33.4.459>] [PMID: 20394314]
- [5] Buysse DJ, Reynolds CF III, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Res* 1989; 28(2): 193-213.
[[http://dx.doi.org/10.1016/0165-1781\(89\)90047-4](http://dx.doi.org/10.1016/0165-1781(89)90047-4)] [PMID: 2748771]
- [6] Riedel BW, Lichstein KL. Insomnia and daytime functioning. *Sleep Med Rev* 2000; 4(3): 277-98.
[<http://dx.doi.org/10.1053/smr.1999.0074>] [PMID: 12531170]
- [7] Shittu R, Issa B, Olanrewaju G, *et al.* Association between subjective sleep quality, hypertension, depression and body mass index in a nigerian family practice setting. *J Sleep Disord Ther* 2014; 3: 157.
[<http://dx.doi.org/10.4172/2167-0277.1000157>]
- [8] Fortunato V, Harsh J. Stress and sleep quality: The moderating role of negative affectivity. *Pers Individ Dif* 2006; 41: 825-36.
[<http://dx.doi.org/10.1016/j.paid.2006.03.024>]
- [9] Knudsen HK, Ducharme LJ, Roman PM. Job stress and poor sleep quality: Data from an American sample of full-time workers. *Soc Sci Med* 2007; 64(10): 1997-2007.
[<http://dx.doi.org/10.1016/j.socscimed.2007.02.020>] [PMID: 17363123]
- [10] Hirsch JD, Do AH, Hollenbach KA, Manoguerra AS, Adler DS. Students' health-related quality of life across the preclinical pharmacy curriculum. *Am J Pharm Educ* 2009; 73(8): 147.
[<http://dx.doi.org/10.5688/aj7308147>] [PMID: 20221340]
- [11] Akerstedt T. Psychosocial stress and impaired sleep. *Scand J Work Environ Health* 2006; 32(6): 493-501.
[<http://dx.doi.org/10.5271/sjweh.1054>] [PMID: 17173205]
- [12] Kim E-J, Dimsdale JE. The effect of psychosocial stress on sleep: A review of polysomnographic evidence. *Behav Sleep Med* 2007; 5(4): 256-78.
[<http://dx.doi.org/10.1080/15402000701557383>] [PMID: 17937582]
- [13] Beiske KK, Kjelsberg FN, Ruud EA, Stavem K. Reliability and validity of a Norwegian version of the Epworth sleepiness scale. *Sleep Breath* 2009; 13(1): 65-72.
[<http://dx.doi.org/10.1007/s11325-008-0202-x>] [PMID: 18560916]
- [14] Bertolazi AN, Fagondes SC, Hoff LS, *et al.* Validation of the Brazilian Portuguese version of the pittsburgh sleep quality index. *Sleep Med* 2011; 12(1): 70-5.
[<http://dx.doi.org/10.1016/j.sleep.2010.04.020>] [PMID: 21145786]
- [15] Oginska H, Pokorski J. Fatigue and mood correlates of sleep length in three age-social groups: School children, students, and employees. *Chronobiol Int* 2006; 23(6): 1317-28.
[<http://dx.doi.org/10.1080/07420520601089349>] [PMID: 17190716]
- [16] Tsai L-L, Li S-P. Sleep patterns in college students: Gender and grade differences. *J Psychosom Res* 2004; 56(2): 231-7.
[[http://dx.doi.org/10.1016/S0022-3999\(03\)00507-5](http://dx.doi.org/10.1016/S0022-3999(03)00507-5)] [PMID: 15016583]
- [17] James B, Omoaregba J, Igberase O. Prevalence and correlates of poor sleep quality among medical students at a Nigerian university. *Ann Niger Med* 2011; 5(1): 1-5.
[<http://dx.doi.org/10.4103/0331-3131.84218>]
- [18] World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA* 2013; 310(20): 2191-4.

- [http://dx.doi.org/10.1001/jama.2013.281053] [PMID: 24141714]
- [19] Kessler RC, Andrews G, Colpe LJ, *et al.* Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med* 2002; 32(6): 959-76.
[http://dx.doi.org/10.1017/S0033291702006074] [PMID: 12214795]
- [20] Furukawa TA, Kessler RC, Slade T, Andrews G. The performance of the K6 and K10 screening scales for psychological distress in the Australian national survey of mental health and well-being. *Psychol Med* 2003; 33(2): 357-62.
[http://dx.doi.org/10.1017/S0033291702006700] [PMID: 12622315]
- [21] Backhaus J, Junghanns K, Broocks A, Riemann D, Hohagen F. Test-retest reliability and validity of the pittsburgh sleep quality index in primary insomnia. *J Psychosom Res* 2002; 53(3): 737-40.
[http://dx.doi.org/10.1016/S0022-3999(02)00330-6] [PMID: 12217446]
- [22] World Health Organization. WHO: Global Database on Body Mass Index n.d. Available from: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html
- [23] Suen LKP, Hon KL, Tam WWS. Association between sleep behavior and sleep-related factors among university students in Hong Kong. *Chronobiol Int* 2008; 25(5): 760-75.
[http://dx.doi.org/10.1080/07420520802397186] [PMID: 18780202]
- [24] Ahrberg K, Dresler M, Niedermaier S, Steiger A, Genzel L. The interaction between sleep quality and academic performance. *J Psychiatr Res* 2012; 46(12): 1618-22.
[http://dx.doi.org/10.1016/j.jpsychires.2012.09.008] [PMID: 23040161]
- [25] Lai PP, Say YH. Associated factors of sleep quality and behavior among students of two tertiary institutions in Northern Malaysia. *Med J Malaysia* 2013; 68(3): 195-203.
[PMID: 23749006]
- [26] Eller T, Aluoja A, Vasar V, Veldi M. Symptoms of anxiety and depression in Estonian medical students with sleep problems. *Depress Anxiety* 2006; 23(4): 250-6.
[http://dx.doi.org/10.1002/da.20166] [PMID: 16555263]
- [27] Pearson NJ, Johnson LL, Nahin RL. Insomnia, trouble sleeping, and complementary and alternative medicine: Analysis of the 2002 national health interview survey data. *Arch Intern Med* 2006; 166(16): 1775-82.
[http://dx.doi.org/10.1001/archinte.166.16.1775] [PMID: 16983058]
- [28] Bidulescu A, Din-Dzetham R, Coverson DL, *et al.* Interaction of sleep quality and psychosocial stress on obesity in African Americans: The Cardiovascular Health Epidemiology Study (CHES). *BMC Public Health* 2010; 10: 581.
[http://dx.doi.org/10.1186/1471-2458-10-581] [PMID: 20920190]
- [29] Xu Z, Su H, Zou Y, Chen J, Wu J, Chang W. Sleep quality of Chinese adolescents: Distribution and its associated factors. *J Paediatr Child Health* 2012; 48(2): 138-45.
[http://dx.doi.org/10.1111/j.1440-1754.2011.02065.x] [PMID: 21470332]
- [30] Byrd K, Gelaye B, Tadessea MG, Williams MA, Lemma S, Berhanec Y. Sleep disturbances and common mental disorders in college students. *Health Behav Policy Rev* 2014; 1(3): 229-37.
[http://dx.doi.org/10.14485/HBPR.1.3.7] [PMID: 25309939]
- [31] Carney CE, Edinger JD, Meyer B, Lindman L, Istre T. Daily activities and sleep quality in college students. *Chronobiol Int* 2006; 23(3): 623-37.
[http://dx.doi.org/10.1080/07420520600650695] [PMID: 16753946]
- [32] Curcio G, Ferrara M, De Gennaro L. Sleep loss, learning capacity and academic performance. *Sleep Med Rev* 2006; 10(5): 323-37.
[http://dx.doi.org/10.1016/j.smrv.2005.11.001] [PMID: 16564189]
- [33] Jose PE, Ratcliffe V. Stressor frequency and perceived intensity as predictors of internalizing symptoms: Gender and age differences in adolescence. *N Z J Psychol* 2004; 33: 145-54.
- [34] Barliana MI, Amalya SN, Pradipta IS, *et al.* DNA methyltransferase 3A gene polymorphism contributes to daily life stress susceptibility. *Psychol Res Behav Manag* 2017; 10: 395-401.
[http://dx.doi.org/10.2147/PRBM.S152451] [PMID: 29290696]
- [35] Accreditation Council For Pharmacy Education. Accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of pharmacy degree 2015. Available from: <https://www.acpe-accredit.org/pdf/Standards2016FINAL.pdf>
- [36] Canales-Gonzales LP, Kranz PL. Perceived stress by students in a pharmacy curriculum, education. *Education* 2008; 129: 139-46.