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Binary Logistic Regression Analysis of Quarter-Life Crisis Symptoms on Sleep Difficulties in Early Indonesian Adulthood

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Abstract

Quarter-life crisis and sleep difficulties are psychological phenomena commonly experienced during early adulthood. A 2017 LinkedIn survey revealed that 75% of respondents had experienced a quarter-life crisis. The WHO in 2020 reported that 19.1% of the global population suffered from sleep difficulties. In Indonesia, a similar trend has been observed. This study aims to identify quarter-life crisis symptoms that influence sleep difficulties among individuals in early adulthood, using a binary logistic regression model. Binary logistic regression is used when the response variable is dichotomous, estimating the probability of an outcome based on several predictor variables. This quantitative research uses secondary data from the fifth wave of the Indonesian Family Life Survey (IFLS 5). The response variable is sleep difficulty (yes/no), while the predictor variables include aspects of psychological health and coping efforts, such as difficulty concentrating, feeling disturbed, feeling pressured, requiring effort, inability to start something, hope for the future, future expectations, feeling of fear, feeling isolated, life satisfaction, happiness, religious obedience, and smoking behavior. The results showed that among females, significant predictors included difficulty concentrating, feeling disturbed, fear, isolation, and happiness. Among males, significant predictors included difficulty concentrating, feeling disturbed, requiring effort, inability to start something, fear, and smoking behavior. These results indicate that certain psychological symptoms related to quarter-life crisis significantly affect sleep difficulties, with different patterns between genders. It can be concluded that gender-specific psychological interventions may help reduce sleep-related issues among early adults experiencing a quarter-life crisis.

Keywords: Binary logistic regression model, Early adulthood, Quarter-life crisis, Sleep difficulties.

1. INTRODUCTION

A person is considered to be in the productive age group if they fall within the age range of 15 to 64 years [7]. Indonesia is projected to experience a demographic bonus until 2035, with its peak expected to occur between 2020 and 2030. This is indicated by the increasing number of individuals in the productive age group, which is nearly double that of children and the elderly. This demographic condition contributes significantly to national economic growth. One subgroup within the productive age group is early adulthood, which is a transitional period toward maturity in various

aspects [39]. Different sources define early adulthood using various age spans, including 26–35 years [6], 21–40 years [36], and 16–40 years [8]. This stage includes the phases of trial with commitment (ages 25 to 30), when individuals begin to settle into their careers, and the advancement phase (ages 31 to 44), when the focus shifts to career stability and growth [11]. Although individuals in early adulthood have great potential, they are also vulnerable to various challenges, particularly mental health issues, which may affect their productivity.

During early adulthood, individuals are prone to experiencing mental health disturbances [18], including the quarter-life crisis. This condition refers to an emotional crisis triggered by anxiety related to one's future, career, and relationships [22]. A LinkedIn survey reported that 75 percent of respondents aged 25 to 33 had experienced a quarter-life crisis, with career uncertainty being the main cause [21]. In Indonesia, Iqomah et al. found that 40 percent of respondents aged 18 to 29 experienced a moderate level of quarter-life crisis [16]. Similarly, Zharifa et al. found that most university students experienced symptoms of a quarter-life crisis, primarily related to career, education, and financial concerns [41]. This condition can negatively affect daily activities and reduce productivity, even though individuals in this age group are expected to contribute significantly to national development.

Quality sleep is a basic human need, but many individuals in early adulthood have difficulty sleeping or suffer from insomnia [15]. Adults generally require 7 to 8 hours of sleep per day [19]. However, high psychological pressure and busy routines make them vulnerable to sleep disturbances. Insomnia is characterized by difficulty initiating or maintaining sleep and may lead to fatigue and reduced productivity in daily activities [24]. According to Juwita et al., referring to data from the World Health Organization (WHO) in 2020, around 19.1% of the world's population has experienced sleep difficulties accompanied by severe complaints [17]. In Indonesia, the estimated prevalence of insomnia is around 10% to 11% [28]. Difficulty sleeping among individuals in the productive age group, particularly in early adulthood, may also be an indicator of psychological stress, such as a quarter-life crisis.

Several previous studies have examined the factors that influence sleep disturbances. Quarter-life crisis during early adulthood is strongly associated with stress, anxiety, and emotional pressure, all of which can trigger insomnia or hypersomnia [30], [1]. Depression, which is one of the common symptoms of a quarter-life crisis, can further aggravate sleep problems, especially when accompanied by cognitive difficulties or impairments [2]. Other factors that contribute to sleep disturbances include chronic pain, low income, smoking, poor psychological resilience, economic hardship, and unhealthy lifestyles [34], [38]. Although various psychological factors contributing to sleep disturbances have been widely studied, the specific relationship between quarter life crisis symptoms, which reflect various forms of psychological pressure and sleep difficulties in early adulthood remains underexplored, particularly using comprehensive statistical approaches. To date, no previous research has examined the association between quarter life crisis and sleep difficulties using IFLS 5 data. Therefore, this study offers a novel contribution by identifying the influence patterns of quarter life crisis symptoms on sleep difficulties through a binary logistic regression model based on IFLS 5 data.

Based on this context, the purpose of this study is to analyze the relationship between quarter-life crisis symptoms and sleep disturbances in early adulthood. In Indonesia, a national-scale survey known as the Indonesian Family Life Survey (IFLS) was conducted to examine the socio-economic, health, and demographic dynamics of Indonesian society. This study uses data from IFLS 5, which includes approximately 30,000 respondents from 13 provinces and represents about 83 percent of Indonesia’s population [37]. The data were collected during 2014 and 2015 by SurveyMETER in collaboration with the RAND Corporation.

The analysis in this study employs binary logistic regression, as the response variable has two categories, namely “yes” and “no.” This regression method is suitable for examining relationships involving a binary categorical dependent variable [12]. This method uses a logit function to transform probabilities into log-odds, thereby allowing for a non-linear relationship between predictors and probabilities. Thus, this model not only identifies whether a quarter-life crisis symptom has a significant relationship with sleep difficulties but also quantifies the likelihood (odds ratio) of sleep difficulties occurring when that symptom is present, while controlling for other variables. The model was used to analyze the relationship between sleep disturbances and various predictor variables, including difficulty concentrating, feeling disturbed, feeling pressured, requiring effort to do things, inability to start something, having hope for the future, future expectations, the feeling of fear, feeling isolated, life satisfaction, happiness, religious obedience, and smoking behavior.

2. MATERIAL AND METHODS

2.1 Types and Sources of Data

This study utilizes secondary data from the Indonesian Family Life Survey (IFLS), a longitudinal survey conducted by the RAND Corporation in collaboration with SurveyMETER. The IFLS consists of five waves, namely IFLS 1 (1993/1994), IFLS 2 (1997), IFLS 2+ (1998), IFLS 3 (2000), IFLS 4 (2007/2008), and IFLS 5 (2014/2015). The survey represents approximately 83 percent of Indonesia’s population, covering 13 out of the 27 provinces. The sample was selected using a stratified sampling scheme that considered cultural and socio-economic diversity [37]. This study uses data from IFLS5, which includes 50,148 respondents. The research sample consists of individuals aged 25 to 30 years. This age range was selected because it corresponds to the trial with commitment substage, during which individuals tend to feel more settled in their careers and begin to maintain and stabilize their career choices as part of their developmental tasks. Therefore, psychological dynamics such as doubt, social pressure, and the search for meaning in life, which are characteristic of the quarter-life crisis, are especially relevant to study. After excluding invalid responses, such as blank answers, "don’t know" responses, or missing values (NA), a total of 4502 respondents with complete data were included in the analysis. This sample consisted of 1992 males and 2510 females. The analysis was conducted separately by gender. The data in this research was processed using R Studio software.

2.2 Research Variables

The response variable in this study is the perception of early adulthood in Indonesia regarding the difficulty of initiating sleep. The assessment of sleep difficulty is based on respondents’ subjective perception of how easily they are able to fall asleep. Meanwhile, the predictor variables consist of indicators of quarter-life crisis symptoms, selected based on findings from previous studies and adjusted to the availability of data in IFLS5. The predictor variables include difficulty concentrating, feeling disturbed, feeling pressured, requiring effort to do things, feeling unable to start something, having hope for the future, expectations about the future, feeling afraid, feeling isolated, life satisfaction, happiness, religiosity, and smoking behavior.

Various psychological symptoms associated with the quarter-life crisis are closely linked to sleep difficulties. Stress, worry, and emotional pressure can lead to concentration problems, feeling disturbed, overthinking, and feelings of pressure that disrupt sleep quality [29], [26], [32]. Low self-confidence is reflected in feelings of inability to start something or needing significant effort, which may contribute to the emergence of sleep disorders [20]. Anxiety due to high hopes and expectations about the future, feelings of fear, and feelings of loneliness or isolation can also worsen sleep quality [10], [27], [35]. Conversely, higher levels of life satisfaction, happiness, and religiosity are generally

associated with better sleep quality [42], [38], [5], while smoking behavior increases the risk of insomnia [25]. The classification of the response variable is detailed in Table 2.1.

Table 2.1. Research Variable

Variable	Name of Variable	Questionnaire description	Description	Scale
Y	Sleep Difficulties	1: Never 2: Rarely 3: Sometimes 4: Often 5: Always	0: No 1: Yes	Nominal
X_1	Difficulty Concentrating	1: Rarely or Never (< 1 day) 2: A little (1-2 day) 3: Sometimes (3-4 day) 4: Often (5-7 day)	0: No 1: Yes	Nominal
X_2	Feeling Disturbed	1: Rarely or Never (< 1 day) 2: A little (1-2 day) 3: Sometimes (3-4 day) 4: Often (5-7 day)	0: No 1: Yes	Nominal
X_3	Feeling Pressured	1: Rarely or Never (< 1 day) 2: A little (1-2 day) 3: Sometimes (3-4 day) 4: Often (5-7 day)	0: No 1: Yes	Nominal
X_4	Requiring Effort To Do Things	1: Rarely or Never (< 1 day) 2: A little (1-2 day) 3: Sometimes (3-4 day) 4: Often (5-7 day)	0: No 1: Yes	Nominal
X_5	Inability To Start Something	1: Rarely or Never (< 1 day) 2: A little (1-2 day) 3: Sometimes (3-4 day) 4: Often (5-7 day)	0: No 1: Yes	Nominal
X_6	Having Hope For The Future	1: Rarely or Never (< 1 day) 2: A little (1-2 day) 3: Sometimes (3-4 day) 4: Often (5-7 day)	0: No 1: Yes	Nominal
X_7	Future Expectations	1: Economic level 1 2: Economic level 2 3: Economic level 3 4: Economic level 4 5: Economic level 5 6: Economic level 6 8: Don't Know	1: Economic level 1 2: Economic level 2 3: Economic level 3 4: Economic level 4 5: Economic level 5	Ordinal

Variable	Name of Variable	Questionnaire description	Description	Scale
			6: Economic level	
X_8	Feeling of Fear	1: Rarely or Never (< 1 day) 2: A little (1-2 day) 3: Sometimes (3-4 day) 4: Often (5-7 day)	0: No 1: Yes	Nominal
X_9	Feeling Isolated	1: Rarely or Never (< 1 day) 2: A little (1-2 day) 3: Sometimes (3-4 day) 4: Often (5-7 day)	0: No 1: Yes	Nominal
X_{10}	Life Satisfaction	1: Extremely satisfied 2: Very satisfied 3: Somewhat satisfied 4: Dissatisfied 5: Verry dissatisfied	1: Verry dissatisfied 2: Dissatisfied 3: Somewhat satisfied 4: Very satisfied 5: Extremely satisfied	Ordinal
X_{11}	Happiness	1: Very happy 2: Happy 3: Unhappy 4: Very unhappy	1: Very unhappy 2: Unhappy 3: Happy 4: Very happy	Ordinal
X_{12}	Religious Obedience	1: Very obedient 2: Obedient 3: Somewhat obedient 4: Not obedient 7: Refused to answer	1: Not obedient 2: Somewhat obedient 3: Obedient 4: Very obedient	Ordinal
X_{13}	Smoking Habits	1: Yes 3: No	0: No 1: Yes	Nominal

2.3 Multiple Logistic Regression

Regression analysis is a statistical approach used to examine the relationship between a response variable and one or more predictor variables [33]. In multiple linear regression, the model includes more than one predictor and is generally expressed as Equation (2.1):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon \quad (2.1)$$

where Y is the response variable, $X_1, X_2, \ldots, X_k$ are predictor variables, β_0 is the intercept, $\beta_1, \beta_2, \ldots, \beta_k$ are regression coefficients, and ε is the error.

2.4 Binary Logistic Regression

Binary logistic regression is used to explain the relationship between a categorical response variable (nominal or ordinal) and one or more predictor variables. When the response variable is binary, this type of regression is appropriate [12]. The model estimates the logit of the probability of success as a linear function of the predictor variables. Let Y denotes a binary response variable, $\mathbf{X} = (X_1, \dots, X_k)$ denotes the predictor variables, and $P(Y = 1)$ denotes by $\pi(\mathbf{X})$ so that the general form of the binary logistic regression model is defined as shown in Equation (2.2) [15]:

$$\text{Logit}\,[\pi(\mathbf{X})] = \ln\left[\frac{\pi(\mathbf{X})}{1-\pi(\mathbf{X})}\right] = \beta_0 + \beta_1 X_1 + \cdots + \beta_k X_k \tag{2.2}$$

where $\text{logit}\,[\pi(\mathbf{X})]$ is the logit function and $\beta_0, \beta_1, \dots, \beta_k$ are the regression coefficients. The probability of success $\pi(\mathbf{X})$ can be written as shown in Equation (2.3):

$$\pi(\mathbf{X}) = \frac{e^{\beta_0+\beta_1 X_1+\cdots+\beta_k X_k}}{1 + e^{\beta_0+\beta_1 X_1+\cdots+\beta_k X_k}} \tag{2.3}$$

2.5 Multicollinearity

To obtain accurate parameter estimates in logistic regression, it is important to ensure that there is no perfect multicollinearity among the predictor variables. Perfect multicollinearity occurs when one predictor variable is a linear combination of others. A common method to detect multicollinearity is the variance inflation factor (VIF), which is based on the coefficient of determination. R_j^2 from regressing one predictor variable on the others. The value of R_j^2 is calculated using the formula $R_j^2 = 1 - \frac{SS_{res,j}}{SS_{tot,j}}$, where $SS_{res,j}$ is the residual sum of squares and $SS_{tot,j}$ is the total sum of squares is the total sum of squares from the regression of the $j$cpredictor variable on all the other predictor variables. Then, the VIF for the j-th predictor variable is calculated using Equation (2.4):

$$VIF = \frac{1}{(1 - R_j^2)} \tag{2.4}$$

$VIF < 10$ indicates that multicollinearity is not a concern [13]. For non-numeric predictor variables, multicollinearity can still occur after they are transformed into dummy variables or contrast-coded for inclusion in the regression model. In this case, VIF can still be calculated using the same regression-based approach applied to each dummy-coded variable. If a categorical variable has k categories, it will be represented by $k - 1$ dummy variables, with one category serving as the reference. This method ensures that multicollinearity detection remains valid and accurate for all variable types in the logistic regression model.

2.6 Parameter Estimation

Binary logistic regression is often modeled using the Bernoulli distribution, a special case of the binomial distribution involving only a single trial [3]. Let Y_i denotes the response variable for the i^{th} individual or observation. For a sample of n individuals, the values $Y_1, Y_2, \dots, Y_n$ represent their corresponding responses. $Y_i = 1$ indicates success with probability $P(Y_i = 1) = \pi(\mathbf{X}_i)$, and $Y_i = 0$ indicates a failure with probability $P(Y_i = 0) = 1 - \pi(\mathbf{X}_i)$ [15]. The probability mass function for binary outcomes is expressed in Equation (2.5) as follows:

$$P(Y_i = y_i) = \pi(\mathbf{X}_i)^{y_i}[1 - \pi(\mathbf{X}_i)]^{1-y_i} \tag{2.5}$$

The likelihood function, which serves as the basis for maximum likelihood estimation (MLE), can be written as shown in Equation (2.6):

$$L(\boldsymbol{\beta}) = \prod_{i=1}^{n} \pi(\mathbf{X}_i)^{y_i}[1 - \pi(\mathbf{X}_i)]^{1-y_i} \tag{2.6}$$

The parameter estimates $\beta_0, \beta_1, \ldots, \beta_k$ are obtained by maximizing the log-likelihood function shown in equation (2.7):

$$\begin{aligned} \ln[L(\boldsymbol{\beta})] &= \ln\left(\prod_{i=1}^{n} \pi(\mathbf{X}_i)^{y_i}[1 - \pi(\mathbf{X}_i)]^{1-y_i}\right) \\ &= \sum_{i=1}^{n} y_i \ln[\pi(\mathbf{X}_i)] + (1 - y_i) \ln[1 - \pi(\mathbf{X}_i)] \\ &= \sum_{i=1}^{n} y_i(\beta_0 + \beta_1 X_{i1} + \cdots + \beta_k X_{ik}) \\ &\quad - \ln(1 + \exp(\beta_0 + \beta_1 X_{i1} + \cdots + \beta_k X_{ik})) \end{aligned} \tag{2.7}$$

This log-likelihood function is then optimized to obtain the maximum likelihood estimates of the regression coefficients [14].

2.7 Parameter Testing

2.7.1. Simultaneous Parameter Testing

Significance testing in binary logistic regression aims to assess whether the set of predictor variables significantly contribute to the model [14]. Simultaneous parameter testing is conducted using the likelihood ratio test (LRT), which examines whether all regression coefficients are jointly equal to zero. The null hypothesis defines as H_0: $\beta_1 = \beta_2 = \ldots = \beta_k = 0$ (None of the predictors have an effect) and the alternative hypothesis defines as H_1: $\exists \beta_j \neq 0, j = 1, \ldots, k$ (at least one predictor affects the logit). The test statistic is calculated using the formula written in Equation (2.8) [14]:

$$G = -2\, ln\left(\frac{L_0}{L_1}\right) \tag{2.8}$$

where L_0 is the likelihood of the null model (without predictors) and L_1 is the likelihood of the full model (with predictors). The null hypothesis is rejected if the test statistic G exceeds the chi-square critical value at the 5% significance level with k degrees of freedom (where k is the number of predictors), or if the $p - value < 0.05$.

2.8.1. Partial Parameter Testing

Partial significance testing for each predictor is performed using the Wald test. This test evaluates the individual contribution of each variable while controlling for the others. The null hypothesis is H_0: $\beta_j = 0$ (The predictor has no effect) and the alternative hypothesis is H_1: $\beta_j \neq 0$ (The predictor has an effect). The Wald statistic is written in equation (2.9) [14]:

$$W = \frac{\hat{\beta}_j}{\widehat{SE}(\hat{\beta}_j)} \tag{2.9}$$

where $SE(\hat{\beta}_j) = \sqrt{var(\hat{\beta}_j)}$ is the standard error of the estimated coefficient, calculated as the square root of its variance. The null hypothesis is rejected if the $|W|$ exceeds the standard normal critical value $Z_{0,025} \approx 1.96$, or if the $p - value < 0.05$.

2.8 Odds Ratio

The odds ratio (OR) measures the association between a predictor and the likelihood of an event, obtained by exponentiating the logistic regression coefficient [14]. It compares the odds of an event occurring when a predictor variable increases by one unit, assuming other variables are constant. For predictor X_j, the odds ratio is calculated using Equation (2.10):

$$\widehat{OR} = \exp(\hat{\beta}_j) \tag{2.10}$$

An $OR > 1$ increased likelihood of the event, $OR < 1$ decreased likelihood of the event, and $OR = 1$ implies no association between the predictor and the response variable. The 95% confidence interval for the odds ratio is shown in equation (2.11):

$$\widehat{OR} = \exp\left(\hat{\beta}_j \pm z_{\frac{\alpha}{2}} SE(\hat{\beta}_j)\right) \tag{2.11}$$

3. RESULTS

3.1. Descriptive Analysis

The frequency distribution for the response variable and predictor variables in this study is presented in Table 3.1. Table 3.1 presents the frequency distribution of research variables by gender, sleep difficulty status, and several variables identified as symptoms of quarter-life crisis in previous studies. Out of 2510 female respondents, 1229 (48,96%) reported experiencing sleep difficulties. Among 1992 male respondents, 1141 (57,28%) reported sleep difficulties.

Table 3.1. Frequency Distribution of Research Variables

Variable	Total (%) (Female)	Experiencing Sleep Difficulties (Female)	Total (%) (Male)	Experiencing Sleep Difficulties (Male)
Sleep Difficulties	2510	1229 (48.96)	1992	1141 (57.28)
Difficulty Concentrating				
Yes	1109 (44.18)	715 (58.18)	901 (45.23)	647 (56.7)
No	1401 (55.82)	514 (41.82)	1091 (54.77)	494 (43.3)
Feeling Disturbed				
Yes	1045 (41.63)	660 (53.7)	769 (3 8.6)	550 (48.2)
No	1465 (58.37)	569 (46.3)	1223 (61.4)	591 (51.8)
Feeling Pressured				
Yes	741 (29.52)	508 (41.33)	670 (33.63)	489 (42.86)
No	1769 (70.48)	721 (58.67)	1322 (66.37)	652 (57.14)
Requiring Effort to Do Things				
Yes	1214 (48.37)	720 (58.58)	1146 (57.53)	769 (67.4)
No	1296 (51.63)	509 (41.42)	846 (42.47)	372 (32.6)
Inability to Start Something				
Yes	711 (28.33)	465 (37.84)	596 (29.92)	461 (40.4)
No	1799 (71.67)	764 (62.16)	1396 (70.08)	680 (59.6)
Having Hope for The Future				
Yes	2308 (91.95)	1152 (93.73)	1806 (90.66)	1046 (91.67)

Variable	Total (%) (Female)	Experiencing Sleep Difficulties (Female)	Total (%) (Male)	Experiencing Sleep Difficulties (Male)
No	202 (8.05)	77 (6.27)	186 (9.34)	95 (8.33)
Future Expectations				
Economic level 1	24 (0.96)	10 (0.81)	37 (1.86)	25 (2.19)
Economic level 2	87 (3.47)	47 (3.82)	114 (5.72)	61 (5.35)
Economic level 3	328 (13.07)	159 (12.94)	308 (15.46)	169 (14.81)
Economic level 4	823 (32.79)	413 (33.6)	732 (36.75)	434 (38.04)
Economic level 5	833 (33.19)	413 (33.6)	522 (26.2)	291 (25.5)
Economic level 6	415 (16.53)	187 (15.22)	279 (14.01)	161 (14.11)
Feeling of Fear				
Yes	1071 (42.67)	731 (59.48)	688 (34.54)	517 (45.31)
No	1439 (57.33)	498 (40.52)	1304 (65.46)	624 (54.69)
Feeling Isolated				
Yes	520 (20.72)	366 (29.78)	430 (21.59)	332 (29.1)
No	1990 (79.28)	863 (70.22)	1562 (78.41)	809 (70.9)
Life Satisfaction				
Very dissatisfied	17 (0.68)	13 (1.06)	25 (1.26)	16 (1.4)
Dissatisfied	209 (8.33)	128 (10.42)	265 (13.3)	168 (14.72)
Somewhat satisfied	1022 (40.72)	504 (41.01)	863 (43.32)	495(43.38)
Very satisfied	1135 (45.22)	529 (43.04)	747 (37.5)	410 (35.93)
Extremely satisfied	127 (5.06)	55 (4.48)	92 (4.62)	52 (4.56)
Happiness				
Very unhappy	14 (0.56)	13 (1.06)	17 (0.85)	12 (1.05)
Unhappy	73 (2.91)	47 (3.82)	105 (5.27)	65 (5.7)
Happy	2012 (80.16)	1002 (81.53)	1525 (76.56)	874 (76.6)
Very happy	411 (16.37)	167 (13.59)	345 (17.32)	190 (16.65)
Religious Obedience				
Not obedient	66 (2.63)	37 (3.01)	119 (5.97)	73 (6.4)
Somewhat obedient	590 (23.51)	302 (24.57)	645 (32.38)	396 (34.71)
Obedient	1550 (61.75)	740 (60.21)	972 (48.8)	522 (45.75)
Very obedient	304 (12.11)	150 (12.21)	256 (12.85)	150 (13.15)
Smoking Habits				
Yes	35 (1.39%)	19 (1.55)	1536 (77.11)	919 (80.54)
No	2475 (98.61%)	1210 (98.45)	456 (22.89)	222 (19.46)

Among the 1229 female respondents with sleep difficulties, 715 (58.18%) reported difficulty concentrating, 660 (53.7%) felt disturbed, 508 (41.33%) felt pressured, 720 (58.58%) found it effortful to do things, 465 (37.84%) felt unable to start something, and 731 (59.48%) experienced fear. A total of 1,152 (93.73%) reported having hope for the future. The largest proportion of females with sleep difficulties was in economic levels 4 and 5, with 413 individuals (33.60%).

Additionally, 366 (29.78%) of these females also felt isolated. In terms of life satisfaction, the largest group was those who were very satisfied, among whom 529 (43.04%) experienced sleep difficulties. Regarding happiness, most cases came from those who were happy, totaling 1002

(81.53%). Among respondents who were obedient in religious practice, 740 (60.21%) experienced sleep difficulties. Lastly, among female smokers, 19 (1.55%) reported sleep difficulties.

For males, among the 1141 with sleep difficulties, 647 (56.7%) reported difficulty concentrating, 550 (48.2%) felt disturbed, 489 (42.86%) felt pressured, 769 (67.4%) found it effortful to do things, 461 (40.4%) felt unable to start something, and 517 (45.31%) experienced fear. Among those with hope for the future, 1046 (91.67%) reported sleep difficulties. The highest proportion of male respondents with sleep difficulties was found in economic level 4, totaling 434 (38.04%).

Furthermore, 332 (29.1%) also reported feeling isolated. Regarding life satisfaction, most were somewhat satisfied, with 495 (43.38%) experiencing sleep difficulties. In terms of happiness, the highest number of cases was among those who were happy, totaling 874 (76.6%). Among the obedient in religious practice, 522 (45.75%) reported sleep difficulties. Lastly, 919 (80.54%) male smokers experienced sleep difficulties.

3.2. Multicollinearity

At the preliminary stage of binary logistic regression analysis, a multicollinearity test was conducted among the predictor variables to ensure the stability of parameter estimates. This test was conducted by calculating the Variance Inflation Factor (VIF) using multiple linear regression.

Table 3.2. The Results of The VIF Calculation

Variable		VIF Values	
		Female	**Male**
X_1	Difficulty Concentrating	1.682	1.546
X_2	Feeling Disturbed	1.36	1.406
X_3	Feeling Pressured	1.602	1.611
X_4	Requiring Effort to Do Things	1.377	1.349
X_5	Inability to Start Something	1.365	1.442
X_6	Having Hope for The Future	1.059	1.079
X_7	Future Expectations	1.047	1.074
X_8	Feeling of Fear	1.464	1.442
X_9	Feeling Isolated	1.386	1.471
X_{10}	Life Satisfaction	1.133	1.148
X_{11}	Happiness	1.15	1.158
X_{12}	Religious Obedience	1.037	1.051
X_{13}	Smoking Habits	1.01	1.026

As shown in Table 3.2, all VIF values for both female and male groups are less than 10, which indicates that there is no multicollinearity problem among the predictor variables. This suggests that the independent variables can be reliably included in the logistic regression model without causing instability in the estimation of coefficients.

3.3. Parameter Estimation and Odds Ratio

Next, a likelihood ratio test was conducted to compare the null model with the model that included all predictor variables simultaneously. The test statistic for simultaneous testing is the G

statistic, as shown in Equation (2.8). The results of the G statistic and the corresponding p-value calculations are presented in Table 3.3.

Table 3.3. Results of the Likelihood Ratio Test

Sample	LRT Statistic	*p-value*
Female	424.62	0.000
Male	313.67	0.000

For both the female and male groups, the p-values were 0.000. Since the $p - values < 0.05$, it can be concluded that the overall parameter testing is statistically significant, indicating that at least one predictor variable has a significant effect on sleep difficulty.

Subsequently, a partial parameter test was performed using the Wald Test to assess the individual contribution of each predictor variable to the response variable. The test statistic is given by Equation (2.9) and the Wald Test results for each sample group (female and male respondents) are presented in Table 3.4.

Table 3.4. Wald Test Results, Coefficient Estimates, and Odds Ratios

	Variable	Regression Coefficient (F)	*p-value* (F)	*Odds Ratio* (F)	Regression Coefficient (M)	*p-value* (M)	*Odds Ratio* (M)
	Intercept	1.345	0.313	3.842	0.034	0.966	1.035
X_1	**Difficulty Concentrating**						
	No (reference)						
	Yes	0.374	0.001 *	1.454 *	0.5	0.000 *	1.649 *
X_2	**Feeling Disturbed**						
	No (reference)						
	Yes	0.427	0.000 *	1.533 *	0.307	0.01 *	1.359 *
X_3	**Feeling Pressured**						
	No (reference)						
	Yes	0.186	0.117	1.205	0.038	0.772	1.039
X_4	**Requiring Effort to Do Things**						
	No (reference)						
	Yes	0.09	0.372	1.094	0.397	0.000 *	1.487 *
X_5	**Inability to Start Something**						
	No (reference)						
	Yes	0.212	0.058	1.236	0.659	0.000 *	1.933 *
X_6	**Having Hope for The Future**						
	No (reference)						
	Yes	−0.011	0.948	0.989	−0.166	0.334	0.847

	Variable	Regression Coefficient (F)	*p-value* (F)	*Odds Ratio* (F)	Regression Coefficient (M)	*p-value* (M)	*Odds Ratio* (M)
X_7	**Future Expectations**						
	Economic level 1 (reference)						
	Economic level 2	0.636	0.22	1.89	−0.48	0.275	0.619
	Economic level 3	0.4	0.405	1.492	−0.526	0.201	0.591
	Economic level 4	0.481	0.309	1.618	−0.302	0.454	0.739
	Economic level 5	0.463	0.327	1.589	−0.377	0.356	0.686
	Economic level 6	0.316	0.51	1.372	−0.331	0.427	0.718
X_8	**Feeling of Fear**						
	No (reference)						
	Yes	0.886	0.000 *	2.424 *	0.523	0.000 *	1.687 *
X_9	**Feeling Isolated**						
	No (reference)						
	Yes	0.341	0.008 *	1.406 *	0.202	0.186	1.224
X_{10}	**Life Satisfaction**						
	Very dissatisfied (reference)						
	Dissatisfied	−0.05	0.936	0.951	0.052	0.913	1.054
	Somewhat satisfied	−0.519	0.395	0.595	−0.065	0.888	0.937
	Very satisfied	−0.492	0.421	0.612	−0.154	0.742	0.858
	Extremely satisfied	−0.678	0.289	0.508	−0.053	0.918	0.948
X_{11}	**Happiness**						
	Very unhappy (reference)						
	Unhappy	−2.02	0.069	0.133 *	−0.482	0.44	0.617
	Happy	−2.099	0.053	0.123 *	−0.336	0.569	0.715
	Very happy	−2.338	0.032 *	0.097 *	−0.373	0.534	0.689
X_{12}	**Religious Obedience**						
	Not obedient (reference)						
	Somewhat obedient	−0.144	0.614	0.866	0.047	0.833	1.048
	Obedient	−0.174	0.531	0.841	−0.149	0.497	0.862
	Very obedient	−0.114	0.706	0.893	−0.03	0.905	0.97
X_{13}	**Smoking Habits**						
	No (reference)						
	Yes	0.165	0.661	1.18	0.43	0.000 *	1.536 *

*significant (p-value < 0.05); *odds ratio with 95% CI not crossing 1

Based on the results of the parameter testing in Table 3.4, the estimated binary logistic regression model equations were obtained for each sample group. The model for female respondents is presented in Equation (3.1), and the model for male respondents is presented in Equation (3.2).

$$\begin{aligned} logit\left(\hat{P}(Y=1)\right) = {} & 1.346 + 0.374X_{1(difficulty\ concentrating)} + \\ & 0.427X_{2(feeling\ disturbed)} + 0.186X_{3(feeling\ pressured)} + \\ & 0.09X_{4(requiring\ effort)} + 0.212X_{5(inability\ to\ start)} - \\ & 0.011X_{6(having\ hope)} + 0.636X_{7(economic\ 2)} + \\ & 0.4X_{7(economic\ 3)} + 0.481X_{7(economic\ 4)} + 0.463X_{7(economic\ 5)} + \\ & 0.316X_{7(economic\ 6)} + 0.886X_{8(fear)} + \\ & 0.341X_{9(feeling\ isolated)} - 0.05X_{10(dissatisfied)} - \\ & 0.519X_{10(somewhat\ satisfied)} - 0.492X_{10(very\ satisfied)} - \\ & 0.678X_{10(extremely\ satisfied)} - 2.02X_{11(Unhappy)} - \\ & 2.099X_{11(happy)} - 2.338X_{11(very\ happy)} - \\ & 0.144X_{12(somewhat\ obedient)} - 0.174X_{12(obedient)} - \\ & 0.114X_{12(very\ obedient)} + 0.169X_{13(smoking)} \end{aligned} \quad (3.1)$$

$$\begin{aligned} logit\left(\hat{P}(Y=1)\right) = {} & 0.034 + 0.5X_{1(difficulty\ concentrating)} + \\ & 0.307X_{2(feeling\ disturbed)} + 0.038X_{3(feeling\ pressured)} + \\ & 0.397X_{4(requiring\ effort)} + 0.659X_{5(inability\ to\ start)} - \\ & 0.166X_{6(having\ hope)} - 0.48X_{7(economic\ 2)} - \\ & 0.526X_{7(economic\ 3)} - 0.302X_{7(economic\ 4)} - \\ & 0.377X_{7(economic\ 5)} - 0.331X_{7(economic\ 6)} + 0.523X_{8(fear)} + \\ & 0.202X_{9(feeling\ isolated)} + 0.052X_{10(dissatisfied)} - \\ & 0.065X_{10(somewhat\ satisfied)} - 0.154X_{10(very\ satisfied)} - \\ & 0.053X_{10(extremely\ satisfied)} + -0.482X_{11(unhappy)} - \\ & 0.336X_{11(happy)} - 0.373X_{11(very\ happy)} + \\ & 0.047X_{12(somewhat\ obedient)} - 0.149X_{12(obedient)} - \\ & 0.03X_{12(very\ obedient)} + 0.429X_{13(smoking)} \end{aligned} \quad (3.2)$$

with $\hat{P}(Y=1)$ representing the probability of the respondent experiencing sleep difficulties.

Based on the results of the partial parameter test using the Wald Test, several variables were found to significantly influence the likelihood of experiencing sleep difficulties in both female and male respondents. Difficulty concentrating was a significant factor for both genders, with females who experienced concentration issues being 1.454 times more likely and males 1.649 times more likely to experience sleep difficulties compared to those without such difficulties. These findings align with [29] who highlighted that overthinking, which often leads to trouble concentrating, is associated with sleep disturbances. Similarly, feeling disturbed had a significant effect on both groups, increasing the odds of sleep difficulties by 1.533 times for females and 1.359 times for males. This result is consistent with the findings of [26] who reported that feeling disturbed, which may reflect emotional sensitivity, tends to increase the risk of sleep problems.

In contrast, feeling pressured did not significantly affect the likelihood of experiencing sleep difficulties in either group, as the odds remained similar regardless of this feeling. This finding supports the study by [32] which found that stress caused by external pressures was not associated with sleep difficulties. However, requiring effort to do things showed a gender difference, it had no significant effect among females but was a significant factor among males, increasing the odds of

sleep difficulties by 1.487 times. A similar pattern was observed for the variable inability to start something, which was not significant for females but significantly increased the odds by 1.933 times for males. These findings are supported by the research of [33] who suggested that self-efficacy does not have a significant association with sleep problems [33]. Further study by [20] emphasized that self-efficacy may influence sleep quality.

Having a positive future hope and different levels of future expectations did not significantly influence sleep difficulties in either gender. This result is in line with the findings of [4] who found that hope alone is not a significant predictor of sleep disturbances when examined alongside other psychological factors. However, feeling of fear was a strong predictor for both females and males. Females who reported fear were 2.424 times more likely and males 1.687 times more likely to have sleep difficulties. This is consistent with the findings of [27] who showed that anxiety rooted in excessive fear is closely linked to sleep-related problems.

Another variable with a gender difference was feeling isolated. This feeling was significantly associated with sleep difficulties among females, increasing the odds by 1.406 times, but had no significant effect among males. This supports the study by [35] who found a link between loneliness and sleep difficulties. Meanwhile, [31] reported that social isolation was not a significant factor in sleep disturbances. Life satisfaction levels showed no significant association with sleep difficulties for either group. This finding is supported by [42] who found no meaningful relationship between life satisfaction and the occurrence of sleep problems.

In terms of happiness, all categories showed a significant effect among female respondents. Compared to those who were very unhappy, unhappy females had 0.133 times lower odds, those who were happy had 0.123 times lower odds, and those who were very happy had 0.097 times lower odds of experiencing sleep difficulties. For male respondents, none of the happiness categories showed a significant effect. These findings are consistent with [38] who found that increased happiness is associated with fewer symptoms of insomnia. [23] also suggested that women tend to report higher levels of happiness, which could contribute to the differences observed between genders. Religious obedience also had no significant effect across all categories for both female and male respondents. This supports the study by [9] who found that the frequency of religious practice does not have a meaningful relationship with sleep difficulties.

Lastly, smoking habits were not significantly associated with sleep difficulties among females. However, for males, having a smoking habit significantly increased the odds of sleep difficulties by 1.536 times compared to non-smokers. This finding is in line with the research by [40], which stated that smoking in general does not have a strong link to sleep disturbances. Nonetheless, the study by [25] emphasized that smokers may be more vulnerable to experiencing sleep difficulties.

4. CONCLUSION

The binary logistic regression analysis revealed that several quarter-life crisis symptoms significantly influence the likelihood of experiencing sleep difficulties among individuals in early adulthood. Among female respondents, significant predictors included difficulty concentrating, feeling disturbed, feeling of fear, social isolation, and levels of happiness. These findings suggest that emotional and psychological aspects of the quarter-life crisis contribute to sleep difficulties in women, with higher happiness levels being associated with reduced odds of sleep difficulties.

In male respondents, significant predictors included difficulty concentrating, feeling disturbed, feeling fear, requiring effort to do things, inability to start something, and smoking behavior. This indicates that sleep difficulties in men are more closely linked to challenges in self-efficacy and maladaptive behaviors.

Although cognitive and emotional symptoms were common predictors across both groups, women were more affected by social isolation and unhappiness, while men were more influenced

by motivational difficulties and smoking behavior. These findings highlight the importance of gender-specific approaches in addressing sleep problems related to quarter-life crisis experiences.

CONFLICT OF INTEREST

The authors confirm that there is no conflict of interest related to the publication of this article.

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