

## Family Factors and Major Depression in Macau Adolescents

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### ABSTRACT

**Objective:** Aim of this study is to investigate the current condition of adolescent depression in Macau and its relation with family factors, and to provide a reference for formulating policy about the issue

**Material and Methods:** The study used randomised multistage stratified cluster sampling. In March 2021, all students in normal education from Form 1 to Form 6 in day Secondary schools were eligible for study sampling. Patient Health Questionnaire-9 (PHQ-9) used to assess depression severity and a self-formulated questionnaire for investigation of family-related factors..

**Results:** There was total of 939 validated questionnaires, major depression occurred in 16.4% of the study samples, more females had depression than males (21.8% and 11.4%, respectively). Among all family factors, low-income family financial condition (monthly income <10000 MOP) (OR=2.71, 95% CI 1.02-7.21), parents not caring (OR=2.18, 95% CI 1.01-4.69), poor relationship with parents (OR=3.01, 95% CI 1.53-5.91) and often quarrel with parents (OR=3.39, 95%CI 2.12-5.42) had significant correlation with adolescent major depression. The study also noted that female adolescents with major depression were more affected by family factors.

**Conclusion:** According to study results, Family factors and adolescent depression has correlation, it is advised that family intervention can be used as a reference for strategies on improving the adolescent depression problems.

**Keywords:** Depression, adolescents, family relationship, Macau

### INTRODUCTION

Depression is a major mental health concern worldwide. In 2015 World Health Organization (WHO) ranked depressive disorders as the third cause of Disability Adjusted Life Year (DALY) in global adolescents aged 10-19 years old. Within the age 15-19 years group, depressive disorder ranked even higher as the second on the global causes of DALY, only after road injury (1). The most severe consequence of depressive disorders is death by suicide. The link between suicide and depression is well-known. About two-thirds of all depressed patients contemplate suicide, while 10 to 15 percent commit suicide (2).

In Macau, the Centre of Disease Control and Prevention (CDC) conducts a survey on health behaviours in secondary students regularly. In the school year 2017-2018, 13.7% of the students mentioned feeling unhappy or desperate most of the time for at least 2 weeks in the past year. (3) Since this is one of the core symptoms of major depression (4), it is not known whether the students were suffering from a major depressive episode. From 2013 to 2018, suicide attempts have doubled among Macau secondary students (3, 5). This may suggest an increase in major depression. However, there is no data on the prevalence of major depression in Macau adolescents.

With an area of 32.9 km<sup>2</sup> and a total population of about 680,000, Macau is the most crowded place in the world (6). The historic city is in the UNESCO Cultural Heritage list, famous for a mixture of Chinese and Portuguese culture. On the contrary, we are also densely packed with the 24/7 running casinos. With the huge amount of income coming from the gambling business, Macau is the second rich region in Asia in terms of GDP (PPP) per capita (7).

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Since many people work in the gambling or hotel business, many parents need to be on shift. This would definitely decrease the time of being with their children. Reducing time in communication is likely to affect the relationship. All the above situations could have contributed to major depression picture very different from other parts of the world. This study has been designed to assess for major depression in Macau adolescents with results on a validated screening tool for the condition. In addition, we would also like to examine the association between different family factors and major depression among the adolescents. We hypothesise that the development of major depression in adolescents is related to family background and the adolescents' relationship with their parents. To our knowledge, studies on the condition of adolescent depression is lacking in Macau, this is the first study done on the association between family factors and adolescent major depression in Macau. With this study, we aim to provide data that would be of use in future for local Public Health strategies in the prevention and management of adolescent depression.

## MATERIAL and METHODS

### General Study Information

The Study is one part of a cross-sectional study named "Alcohol Use in Macau Secondary Students---a Study on Knowledge, Belief and Behavior of Alcohol Use and their Correlating Factors". In the survey, students of age 11-20 were asked to fill in a questionnaire which contained a total of 73 questions on 7 different parts. This included background information, knowledge about alcohol use, beliefs towards alcohol use, behaviors of alcohol use, family factors, peer factors and mental health condition. Parental consents were obtained for the participation of the students under the age of 18.

The survey was conducted during class time in secondary schools from 28th of March, 2021 to 2nd of April, 2021. A pre-test was conducted on 1st of March, 2021 to establish the validity and reliability of the questionnaire. The questionnaires were filled anonymously with written instructions on the aim of the study.

Since Macau has a 15 years free education scheme, almost all adolescents are enrolled in secondary education except for rare cases such as those having chronic illnesses or disabilities that prohibited them from attending school. A school-based study could be assumed to be highly generalisable to Macau adolescent population as a whole.

### Assessment of major depression

The Chinese version of Patient Health Questionnaire-9 (PHQ-9) was implemented in the aforementioned questionnaire for the assessment of the mental health condition. The PHQ-9 is a self-administered instrument that was developed to measure the severity of an individual's depression by evaluating the depressive symptoms experienced by the individual in the past 2 weeks, using the 9 criteria of major depression listed in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (8). There are 9 questions and the answers to the questions are given on a 4-point Likert scale from score 0 for "not at all" to score 3 for "nearly every day", summing up a total score ranging from 0-27.

The higher the score, the more severe the depressive symptoms. According to the recommendation by the developers of the PHQ-9, depressive symptom scores can be classified by severity into five groups, namely, minimal depression (scores of 0-4), mild depression (5-9), moderate depression (10-14), moderately severe depression (15-19), and severe depression (20-27) (8). The PHQ-9 has also been validated as a reliable screening for adolescent depression in both Hong Kong and Taiwan (9,10). In the study in Taiwan, a PHQ-9 score of 15 had a sensitivity of 0.72 and a specificity of 0.95 for recognising major depressive disorder in Taiwan secondary school (9). In our study, we used PHQ-9 score of 15 as a cut off for major depression.

### Measures for Family Factors

In the study we looked into the correlation between different family factors and major depression in the surveyed adolescents. The factors include:

#### (1) Parental divorce

Information came from answers to the question of parents' marital status. The answers included "married", "single", "divorced", "widowed", "remarried" and "others". Adolescents with answers of "divorced" or "remarried" were defined as "having experienced parental divorce".

#### (2) Parent working on shift

According to the parents' working situation information, the adolescents who responded "need to be on shift" for either father's or mother's work would be defined as having "parent working on shift".

#### (3) Family poverty

The monthly family salary was classified into different ranges, "<10000 MOP (about USD\$1250)", "10001-30000 MOP", "30001-50000 MOP", "50001-70000 MOP and ">70000 MOP". A monthly family salary of <10000 MOP was defined as "family poverty".

#### (4) Parents not caring

The information came from answers to the question "do you think your parents care about you?" Answer options included "care very much", "care", "so-so", "not care" and "not care at all". Those who answered "not care" and "not care at all" were defined as the ones who have parents who are "not caring".

#### (5) Poor relationship with parents

The information came from answers to the question "what do you think about your relationship with your parents?" Answer options included "very good", "good", "not good or bad", "bad" and "very bad". Those who answered "bad" and "very bad" were defined as having "poor relationship with parents".

#### (6) Often quarrel with parents

The information came from answers to the question "how often do you quarrel with your parents in the current semester?" Answer options included "never", "rarely", "sometimes", "always" and "all the time". The adolescents who answered "always" and "all the time" were defined as those who "often quarrel with their parents".

## Sampling, Sample Size and Recruitment Process

In the survey, a total of 24789 secondary students from formal education and vocational education in Macau were eligible for randomisation. It was calculated that at least 648 samples have to be included to achieve a confidence level of 99%, with a sampling error of <5%. Randomisation was done by randomised multistage stratified cluster sampling on school and class bases. Nine hundred seventy-four students from 6 schools and 30 classes were invited to fill-in the questionnaires and 939 valid questionnaires were collected for data analysis.

## Data Analysis

Data analysis was performed using SPSS 25.

The  $\chi^2$  test for significance in contingency tables was used to identify differences in the studied family factors between adolescents with and without major depression. For the specific factor that was found with a statistically significant difference. Logistical regression analysis (LRA) was further calculated to assess for the extent the specific family factor can predict the presence of major depression. Considering the possible confounding effect of sex and age on adolescent major depression, the LRA calculation was adjusted for sex and age.

## RESULTS

### Demographic Data

Among the 939 adolescents who filled in the questionnaires and provided data for this study, 491 (52%) were males, and 448 (48%) were females. The age range was 11-20 years old.

### Depressive Symptoms Score using PHQ-9

In our study, the mean PHQ-9 score was  $8.44 \pm 6.12$ . Over one-third (36.5%) of the adolescents were found to have moderate to severe depressive symptoms (PHQ-9 score 10-27). Major depression (PHQ-9 score  $\geq 15$ ) is found in 16.4% of the adolescents (see table 1).

Higher proportion of females were found to have major depression compared to male (female 24.8%, male 11.4%,  $P < 0.001$ ). There was no difference in the prevalence of major depression in different age groups.

### Prevalence of the Family Factors

Table 2 listed the prevalence of the 6 family factors assessed in our study. In the study, 40% of the adolescents have at least 1 parent working on shift. No differences were found between male and female adolescents in the perception of parent's care and relationship with parents. However, significantly more females often quarrel with their parents (F vs M 16.3% vs 9.8%,  $P < 0.01$ ).

### Correlation of the Family Factors with Major Depression in Macau Adolescents

Among all family factors studied, 4 of which were associated with major depression in the adolescents (see table 3). These factors included family poverty, not caring parents, poor relationship with parents and often quarrel with parents. Aside from family poverty which is significantly related to major depression only in female adolescents, the remaining 3 factors were related to major depression in both males and females.

The odds ratio (OR) of being classified as major depression with the specific family factor are listed in table 4. Those who had poor relationships with their parents and those who often quarrel with them were 3 times more likely to have major depression than those who didn't report having these 2 factors.

In the study, females are more likely than males to have major depression with an OR of 2.13 ( $P < 0.001$ ). As is shown in figure 1 & 2, the problem of "often quarrel with parents" is the only factor that is associated with increased likelihood of major depression in both adolescent females and males. Female adolescents who often quarrel with their parents were 2.5 times more likely to suffer from major depression, while it is 4.6 times more likely in males.

**Table 1.** Prevalence of major depression by sex and age, 2021 Macau

Variables	Mean $\pm$ SD (PHQ-9 score)	Major Depression (%)
Whole Sample	8.44 $\pm$ 6.12	16.4
Gender		
M	7.32 $\pm$ 5.81	11.4
F	9.66 $\pm$ 6.23	21.8
Age Group		
11-12	6.46 $\pm$ 5.77	12.0
13-14	7.96 $\pm$ 5.81	14.0
15-16	8.89 $\pm$ 6.35	18.4
17-20	9.24 $\pm$ 6.10	18.3

**Table 2.** Prevalence of the Family Factors by sex

Variables	M (%)	F (%)	Total (%)
Parental Divorce	11.2	11.4	11.3
Family Poverty	2.7	2.7	2.7
Parents not Caring	3.5	6.0	4.7
Poor Relationship with Parents	4.5	8.0	6.2
Often Quarrel with Parents	9.8	16.3	12.9
Parent Working on Shift	39.0	42.1	40.5

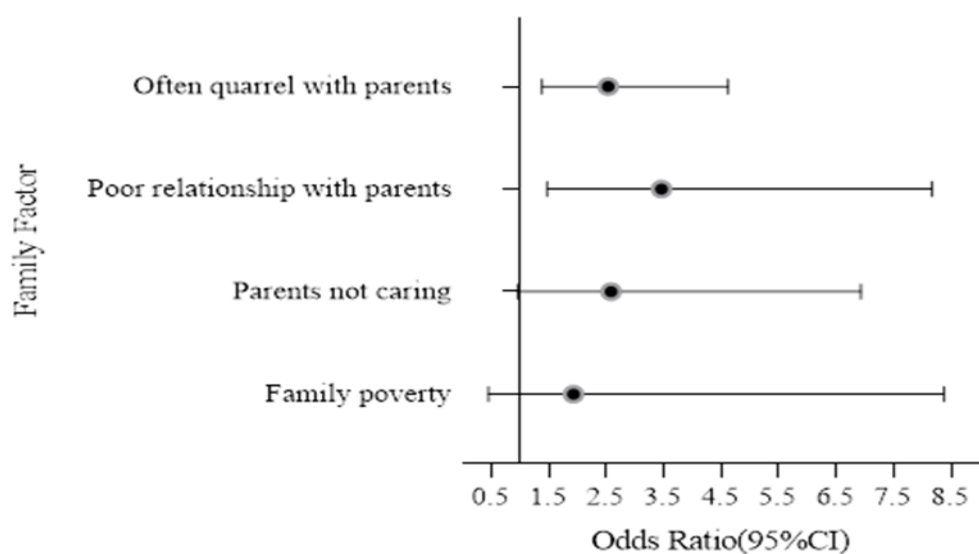
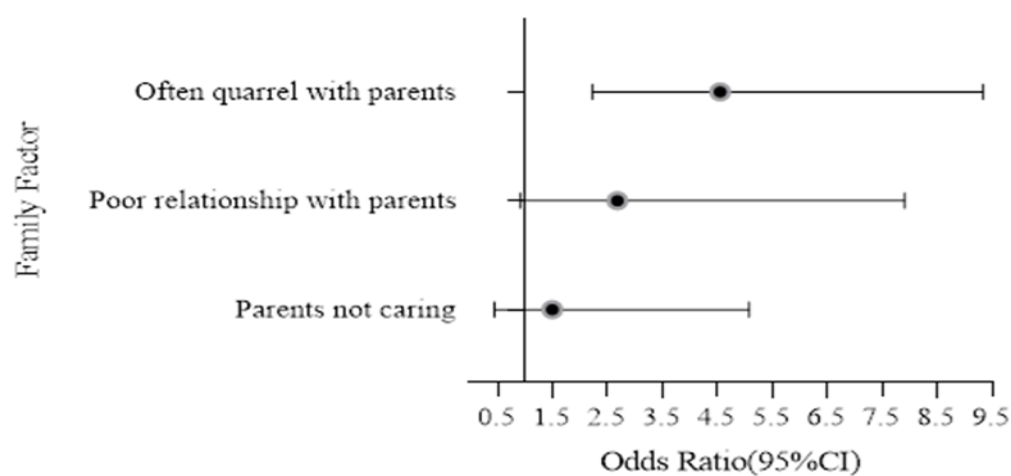
**Table 3.** Prevalence of the Family Factors in Adolescents with Major Depression by sex

Family Factor	Males (%)	Females (%)	Total (%)
Parental Divorce	1.7	3.0	2.3
Family Poverty	0.8	1.6**	1.2**
Parents not Caring	1.2**	3.8***	2.4***
Poor Relationship with Parents	1.6**	5.1***	3.3***
Often Quarrel with Parents	3.5***	7.6***	5.4***
Parent Working on Shift	4.7	10.1	7.3

\*\*p&lt;0.01, \*\*\*p&lt;0.001

**Table 4.** Odds Ratio of the Adolescents with Major Depression and a Specific Family Factor (adjusted for age and sex)

Family Factor	Odds ratio	95% C.I.	p value
Family Poverty	2.71	1.02-7.21	0.046
Parents not Caring	2.18	1.01-4.69	0.047
Poor Relationship with Parents	3.01	1.53-5.91	0.001
Often Quarrel with Parents	3.39	2.12-5.42	0.000

**Figure 1.** Odds Ratio of Major Depression for a Given Family Factor in Females. (CI indicates confidence interval)**Figure 2.** Odds Ratio of Major Depression for a Given Family Factor in Males. (CI indicates confidence interval).



## DISCUSSION

Depression is known to be more prevalent in high-income countries. In 2013, the mean global prevalence of depression (including dysthymia and major depression) in age 5-17 was 6.2%, with the prevalence in high-income regions being 34.54% in contrast to that in low and middle-income regions of 3.01% (11). In 2013, the lifetime prevalence of major depressive episode in high-income countries was estimated to be 14.6% (12). Our study has found that the prevalence of major depression using PHQ-9 in Macau adolescents is 16.4%. This figure is comparable to the estimate in high-income countries.

This high prevalence of adolescent major depression should raise our awareness. More strategies should be implemented on the prevention and management of the problem. For early diagnosis and intervention, screening for major depression could be carried out in secondary schools. In addition, our prevalence figure is much higher compared to the data in Hong Kong, a place with a similar culture as Macau. A study using the same assessment tool in adolescents in Hong Kong found the prevalence of major depression as 7.6% (10), a figure that is less than half of our finding. This is an interesting finding. Further study would be needed to understand why our higher prevalence of adolescent major depression compared to a nearby city with a similar culture.

The adolescent period is the transition period from childhood to adulthood. Many changes take place, which are likely to have an effect on the adolescent's psychosocial functioning. Even though adolescents strive for autonomy from their parents, parent-adolescent interactions are important in terms of their psychological development and the acquisition of the ability for emotional regulation (13). In fact, family factors have been found to have significant associations with adolescent depression in both western countries and family-oriented culture such as the Chinese culture (14, 15). Our study also looked into the prevalence of 6 family factors and their correlations with major depression in adolescents. We found that "often quarrel with parents" is the family factor that is most significantly correlated with major depression in Macau adolescents. In a cross-sectional study in China, family conflict (Pearson correlation analysis  $r=0.38$ ,  $P<0.01$ ) was found to be significantly correlated with adolescent depression (16). The presence of family conflict was associated with significant risk for suicidal behavior in Chinese adolescents with an OR of 4.94 (17). In addition, the bidirectional relationship between conflict with parents and depressive symptoms was reported in a cohort among Canadian adolescents aged 12-14 years old (18). The study concluded that conflicts with parents can lead to depressive symptoms while being depressed would lead to more conflicts with parents.

Our results are consistent with the above findings even though we assessed quarrel frequency instead of the conflict itself. Conflict is a collective term which means "serious disagreement or argument". In the Chinese studies, studied samples only responded to the literal meaning of family conflict, being asked whether they had family conflict or not. In the Canadian study, conflicts with parents included disagreement and arguments with parents.

In our study, we specifically asked about the frequency of quarrels with parents, which is more objective and accurate in terms of the extent of the conflicts the adolescents had with their parents.

According to the attachment theory, secure attachment in childhood is beneficial to positive developmental outcomes with lower levels of depressive symptoms in later lives (19). Many studies later also suggested a strong link between insecure attachment and the development of depression in adolescents (20). While a higher level of parental warmth has been suggested to relate to better outcomes in adolescents (21), a literature review by Maggie Zgambo and her colleagues has also shown that perceived parental warmth decreases the onset of depression symptoms in children and adolescents (22). Our study looks into adolescents' bonding with their parents in the form of the perceived care from their parents and how the adolescents think about their relationship with their parents. As can be predicted from the attachment theory, in our study, adolescents who think that their parents do not care about them and have poor relationships with their parents were statistically more likely to have major depression. In a longitudinal study involving over 1300 12-20 years old adolescents in the Netherlands, a bidirectional relationship between poor relationships with parents and depression has also been suggested (23). It was shown that perceived relationship quality with both fathers and mothers significantly predicted later depressive symptoms, while adolescents who reported higher levels of depressive symptoms perceived lower quality of relationship with both fathers and mothers one or two years later.

The association between financial strain and depression is well-known in adult (24, 25). Studies in adolescents mainly took family poverty or parental low socio-economic status as adverse life events in childhood and investigated for the long-term association of the childhood adversity with adolescent-onset depression (26, 27). For example, a prospective cohort in Australia has suggested a cumulative effect of family poverty experienced early in life on the later development of depression and anxiety in adolescence and adulthood (28). In another cohort in the United States, childhood poverty is shown to be associated with child-onset depression, adolescent-onset depression and young adult-onset depression with ORs of 2.08 ( $P<0.001$ ), 1.61 ( $P<0.05$ ) and 1.71 ( $P<0.05$ ) respectively. In our study, we looked into the association between major depression and family poverty by monthly salary. Our result has also shown that "family poverty" is associated with an increased risk for major depression with an OR of 2.71. Further analysis by sex suggested that the association occurred only in females. This is consistent with the ROOTS study of the environmental pathways from child adversity to adolescent depression which is observed only in girls (29).

Parental divorce is another childhood adversity that has been widely studied (30, 31). In the WHO world mental health survey 2010, childhood adversity of parental divorce was most prevalent in high-income countries (32). From the study by WHO, 10.1% of the studied adults reported experiencing parental divorce in childhood. This figure is comparable to our findings of 11.4% of the adolescents having experienced parental divorce.

While the experience of parental divorce in childhood is found to be associated with adolescent major depression in one study in Europe (33), our findings did not show association between parental divorce and major depression in the adolescents. This may be due to the strong family bond in Chinese culture. Even after divorce, there is other members from the extended family including grandparents to provide support in the care of the children so that the warmth and care from the family is not greatly affected.

Many studies worldwide have found negative impact of parents' non-standard working hours on children's physical and emotional health (34-37). Yet, few studies investigated the association of adolescent depression with parents' working schedule. We specifically looked into the association of adolescent major depression with parent working on shift because shift work is very common in Macau, considering the reliance on casinos and hotel business. In our study, 40.5% of the adolescents has at least one parent working on shift. In contrary to the findings from other studies, our results did not show any association between having parent needing to work on shift and major depression in the adolescents.

Among all 6 family factors being studied, namely parental divorce, family poverty, not caring parents, poor relationship with parents, often quarrel with parents and parents working on shift, 4 of which were significantly correlated with major depression in Macau adolescents. They are family poverty, not caring parents, poor relationship with parents and often quarrel with parents. From the results, we understand that good relationship in the family is more important than a complete family structure in terms of the correlation with major depression in Macau adolescents. We mean the usual structure of having both parents in the family with complete family structure. In our study, the adolescents not with a complete family structure most of the time, i.e. the ones who had parents needing to work on shift or whose parents have divorced, were not with increased risk for major depression. While the increased risk for major depression were seen in the adolescent who perceived their parents to be not caring, who had poor relationship with their parents and who often quarrel with their parents. These results have inferred the importance of promoting parenting skills and encouraging communication within the family to prevent adolescent depression. Considering the increasing risk of major depression in adolescents with family poverty, more work may have to be done to help the low-income families. Emotional support to the children in the family is important in addition to financial subsidies.

There are several limitations of our study. Firstly, all of our assessments are subjective measures or self-report by the adolescents, they may have deviated from the real condition. Self-report method was used in the survey which we extracted the data for convenient collection of the data. For most family factors, it is not easy to have an objective assessment. However future studies should consider to include parents' information instead of relying only on the adolescents' report. More detailed assessment of parent-adolescent relationship should also be conducted using the validated assessment tool. Secondly, the survey was conducted on school days, if the adolescents who were absent thus did not fill in the survey were absent due to severe major depression, the result may be underestimate of the real situation.

Finally, our study is a cross-sectional study that only showed correlations, prospective studies are needed to establish the cause and effect relationship of the family factors with adolescent major depression.

## CONCLUSION

Our study is the first study in Macau that assessed the prevalence of major depression in Macau adolescents and the correlation between adolescent major depression and different family factors. We have found a high prevalence of major depression in Macau adolescents which is comparable to that in high-income countries and strikingly with a figure which is two times that in a nearby city with a similar culture.

Our findings have shown that having poor relationship with parents, with parents not caring, often quarrel with parents and having experienced family poverty are associated with significant risk for major depression, with 2-3 times increased risk compared to adolescents without the problems. There is higher prevalence of major depression in adolescent females and major depression in adolescent females is associated with more family factors. "Often quarrel with parents" is the only factor that is associated with major depression in both males and females.

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**Ethical approval:** The study was conducted according to the guidelines of the Declaration of Helsinki and approved by Local Ethical Committee. All procedures performed in studies with human participants met the ethical standards of the Institutional Research Commission and the 1964 Declaration of Helsinki and its subsequent amendments or comparable ethical standards.

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