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Depression among young adults – risks and protective factors in the COVID-19 pandemic

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Abstract

Purpose: The present study aimed to assess the depression symptoms and predictors of depression in Polish young adults during online learning in the COVID-19 pandemic.

Methods: The online questionnaire, including the Kutcher Adolescent Depression Scale, was distributed to young Poles through school principals. The final sample consisted of 1,500 students between the ages of 18 and 23 attending secondary schools. Multi-variable logistic regression assessed the relationships between sociodemographic factors, pandemic stressors, coping behaviours and depressive symptoms.

Results: 56% of young Polish adults are experiencing significant depressive symptoms (95% CI: 1.82-13.96). Social isolation was recognized as the main stressor. Many significant predictors of depression were captured. Being female, living in the countryside, talking to parents, and participating in sports and hobbies are found to be protective factors. The following sociodemographic factors are important predictors of depression in young adults: being male, attending a secondary school, living in a large city. Experiencing stress due to pandemic and online learning is one of the risk factors for depression.

Conclusions: The majority of young Poles met the criteria for depressive disorders. The initial findings of the presented study not only highlight the need to address mental health consequences for young people during online learning, but also provide the grounds for the development of post-pandemic interventions.

Key words: depression, young adults, online learning, COVID-19, mental health.

INTRODUCTION

The COVID-19 pandemic is increasing mental health problems among the global population. The pandemic has influenced the wellbeing of young adults in several ways, with changes concerning daily routines, online learning, loss of social contacts and personal relationships, decreasing the range of coping strategies. Young adults still depend on close relationships with their parents, and their social interactions play a crucial role in their coping strategies and self-regulation [1]. They had to cope with rising stress levels during the pandemic. As indicated by Chaturvedi *et al.* [2], adults aged 18-22 ($n = 694$) preferred listening to music (23% of participants), online gaming (14%), watching streamed TV content (13%), sleeping (9%), social media (9%), reading (8%), web surfing (5%), meditation (5%), and talking (4%) as a coping strategy during the pandemic. For this group, Instagram (39%) was the most preferred networking site, followed by WhatsApp (23%) and YouTube (23%).

The average time spent on social media for the 18-22 age group was 2.64 h/day (95% CI: 2.50-2.78).

The current evidence concerning the effects of the COVID-19 pandemic on mental health shows an increase in depressive symptoms and anxiety, particularly among high-risk groups [3-8]. Research indicates that a high percentage of young adults reported clinical cut-off symptoms of depression, anxiety and PTSD. An important role in mental health outcomes is attributed to such factors as loneliness, personal coping strategies, resilience, tolerance of distress, and family support [9-14]. It should be remembered that young adults with pre-existing psychiatric disorders and exposed to stress factors at home could be extremely impacted throughout online education and social isolation. Worldwide, 10-20% of children and adolescents experience mental health conditions, but the majority of them do not seek help or receive care. Half of all mental health conditions start by the age of 14 years. Suicide is the third leading cause of

death in 15-19-year-olds. Depression is the ninth leading cause of illness and disability in all adolescents [15, 16].

Researchers from all around the world are interested in the mental health status of young adults, mostly students. In Turkey, Sögüt *et al.* [17] measured the relationship between levels of anxiety and knowledge about COVID-19 among female midwifery students. From 972 participants, 51.1% were 20-to-21 years old with the mean of 20.79. The majority (94.4%) had a low level of anxiety, followed by moderate (4.5%) and potentially concerning levels of anxiety (1.0%). There was a statistically significant difference in Beck Anxiety Inventory (BAI) scores relating to the presence of chronic diseases among the parents or relatives of the female midwifery students and the students visiting the hospital after the coronavirus outbreak. The researchers did not find a significant correlation between BAI score and knowledge levels of coronavirus infection [17].

In China, Feng *et al.* [18] conducted a cross-sectional survey with the participation of 1,346 students (mean age = 19.76 ± 2.23 years, 73% female). In this study, the Positive and Negative Affect Schedule (PANAS), the 7-item Generalized Anxiety Disorder Scale (GAD-7) and the 9-item Patient Health Questionnaire depression scale (PHQ-9) were used to measure mental health status and the Self-Report Altruism Scale (SRA scale) was used to measure altruism levels. This relationship between risk perception and negative affect was moderated by altruism. In contrast to previous studies, an increase in negative affect associated with an increased perception of risk was pronounced among individuals with high altruism [18].

In winter 2020, researchers from China [19] collected responses from 7,800 college students (61.53% women, mean age was 20.54 years). Among the final sample, 7,261 were undergraduates (38.60% men, mean age = 20.22 years, SD = 1.68). The findings indicated that in the young adult group the relationship between COVID-19-related stressful experiences and acute stress disorder could be mediated by resilience ($\beta = 0.01, p < 0.001$), adaptive coping strategies ($\beta = 0.02, p < 0.001$) and social support ($\beta = 0.01, p < 0.001$).

In Belgium, a young adult group, aged 18-30 ($n = 1,479$), was examined with the Hospital Anxiety and Depression scale (HAD). The results showed that 45% of respondents presented anxiety symptoms and 56% showed depressive symptoms. The authors underline the point that reducing uncertainty is necessary to reduce anxiety and depressive symptoms [20].

The authors noticed an increase in the use of unhealthy coping strategies during the pandemic, such as substance and drug use. In spring 2020, Horigan *et al.* [11] conducted a cross-sectional study which evaluated relationships between loneliness and depression, anxiety, alcohol use and drug use. The study sample consisted of 1,008 US young adults aged 18-35 who were recruited through social media. Symptomatology was assessed

using six scales. The results are as follows: 80% of the population reported significant depressive symptoms, 61% reported moderate-to-severe anxiety, 30% disclosed harmful levels of drinking, 22% reported using drugs, and 38% reported severe drug use. It should be noted that young adults reported significant increases across mental health and substance use symptoms since COVID-19. Furthermore, loneliness was associated with higher levels of mental health symptomatology [11].

To assess young Italian adults' mental health status and monitor their mental health trends during the firsts 4 weeks of lockdown, Parola *et al.* [12] conducted a study from mid-March to mid-April 2020. The final sample size was composed of 97 participants between 19 and 29 years of age, who provided online self-reports over a period of 1 month (1-week intervals, T1-T2-T3-T4). The findings confirmed the negative behavioral and emotional responses provoked by COVID-19 quarantine and also highlighted the high level vulnerability of young adults in the development of psychological distress.

Lee *et al.* [13] indicated that young adults were at high risk of increase in loneliness and mental health problems during the COVID-19 pandemic. A total of 564 young adults (mean age = 25.1; 60.7% women) were included in the analyses. The following questionnaires were used in the study: the three-item Loneliness Scale, the Patient Health Questionnaire-4 and the 12-item Multidimensional Scale of Perceived Social Support. In this study, there was a statistically significant increase in both loneliness and depression symptoms from January to April/May 2020. Changes in loneliness appeared to account for much of the increase in depression, as the count ratio for study wave was attenuated and no longer statistically significant after the inclusion of loneliness in the model [13].

An important aspect is the extent to which this pandemic influences the mental health of the young adult population, which is affected by long-term online learning and the impoverishment of social contacts. The identification of both risk and protective factors can play a crucial role in pandemic-related support systems for young adults. Countries across the globe are facing the dilemma of determining appropriate preventive strategies to minimize the psychological impact of the coronavirus. The aim of this study was to identify the risk and protective factors for the mental health of young adults aged 18-23. Our findings can be useful for the design of possible solutions to prevent negative consequences of the pandemic and online education for young adults' mental health.

METHODS

This study was conducted in Poland from 27 November 2020 to 8 January 2021. It was designed as a cross-sectional, observational study that covered all types of school for young adults in Poland, i.e., vocational school,

general secondary school and technical secondary school. The results presented in this work are the overview of the risk and protective factors for mental health issues. In depth analyses of social support as a protective factor are presented in another article [22]. An online semi-structured questionnaire was developed using Google Forms. Invitations to participate in the study were disseminated among principals of primary, secondary, vocational and technical schools. The Ethics Committee of The Maria Grzegorzewska University approved the study procedures (No 5/2020). This study was conducted in accordance with the Declaration of Helsinki. All participants provided their signed informed consent. The participants voluntarily responded to the anonymous survey and expressed their informed consent within the survey. At the same time, they could quit the survey at any point without giving their reasons.

The online questionnaire covered several areas: (1) general sociodemographic data, including health condition; (2) COVID-19 related questions: pandemic worries; (3) distance learning, stress and coping strategies; (4) symptoms of depression, measured by the short version of KADS; (5) level of well-being – Cantril Scale (CE) [21]. The socio-demographic questionnaire covered general health (both mental and somatic). Moreover, further information related to COVID-19, distance learning, stressors and coping strategies was collected. Specifically, participants were asked if they had had any critical life events during previous three months, any difficulties concerning distance learning or worries about COVID-19 and how they were coping with them. Questions concerning stress and coping included the following: “How are you coping with stress during the pandemic?”, “What are the things that make you stressed recently?”, “What kind of support do you need?”. These multiple-choice questions gave participants the possibility to choose from up to twenty answers and include their own answer additionally. The proposed answers both regarding stress and coping covered areas typical for adolescence and early adulthood (study, friendship, intimate relationships, family) and pandemic stressors (isolation, online learning, cases of illness). Depression was measured using the Polish 6-item version of the Kutcher Adolescents Depression Scale (KADS) [23, 24]. The Cantril Scale was used to assess general life satisfaction at the moment of the study and before the pandemic.

Polish validation of 6-item version of KADS in a group of students aged 18-24 years has shown its high reliability and content validity [24]. Respondents indicated the most suitable answer that most accurately described their feelings. The statements are assigned a score of 0-3, where 0 – hardly ever, 1 – sometimes, 2 – most of the time, 3 – all the time. A score of 6 points or higher indicated the risk of depression. We measured life satisfaction using a visual analogue scale with two end-points labelled “the worst possible life for you” and “the best possible life

for you”. Participants were asked to rate their current life satisfaction level and their level of life satisfaction before the pandemic. The Cantril Scale was considered a useful measurement tool to assess general life satisfaction in a group of Polish adolescents [21].

The study group consisted of 1,500 young adults aged 18-23 years ($M = 18.30$; $SD = 0.56$). The vast majority of the group were females ($n = 987$; 65.8%). Secondary school students represent 61.1% of the participants ($n = 916$). The full characteristics of the study group are presented in Table 1.

A series of logic regression analyses was conducted to determine the variables that could predict the mental well-being factors. The general score on KADS was included as a dependent variables in the separate regression models.

Statistical analysis

In order to verify whether sociodemographic and health characteristics, stressors and coping strategies were significant predictors of depression during the COVID-19 outbreak a series of multiple logistic regressions with bootstrapping were performed. To obtain sufficiently accurate 95% BCa confidence intervals, the number of bootstrap samples was on the order of 1000 [25]. First, sociodemographic and health characteristics were introduced into the model as predictors of depression (KADS). The second model involved the strongest stressors (according to the participants) as predictors of depression. The last model examined coping strategies as predictors of depression. To assess whether the estimated multiple logistic models fitted the data, the Hosmer and Lemeshow goodness of fit test was employed [26]. For significant predictors of depression, odd ratios with 95% confidence intervals (CI) were calculated as estimates of relative risk. The statistical analyses were carried out using SPSS version 27 for Windows. Statistical significance for all of the conducted analysis was established at $p < 0.05$.

RESULTS

Depression and general life satisfaction

The average KADS score was 6.82 ($SD = 4.689$; $N = 1500$). The score of 848 participants (56.5%) suggests possible depression and the need for in-depth testing (these participants scored 6 or higher). When asked about thoughts, plans or behaviors related to suicide or self-harm 286 people (19.1%) answered that they had at least fairly frequent experience of such. This implies a significant risk of suicide/self-harm in that group of young adults. On a scale of 0-10, the respondents ($N = 1500$) rated their life satisfaction at the moment of the study to be an average of 5.15 ($SD = 2.181$; $Mdn = 5$). The average life satisfaction before the pandemic was significantly higher.

Stressors and coping strategies

The respondents indicated the following factors to be the most stressful: the pandemic itself according to 403 (26.9%); distance learning – according to 868 (57.9%); limited contacts with friends/family/loved ones – according to 774 (51.6%); learning and performance at school – according to 717 (47.8%); limited possibilities to go out – for 712 (47.5%); 380 respondents (25.3%) indicated problems at school and difficulties with teachers as stressful factors; 159 (10.6%) found relations with one of parent to be an important source of stress, and 168 (11.2%) with both parents, and 11 respondents (7.4%) mentioned a stressful relationship with siblings; 175 (11.7%) indicated their relations with a boyfriend/girlfriend; 233 (15.5%) indicated relationships with their best friends; 171 (11.4%) had stressful relationships with their class, and 301 (20.1%) had stressful relationships with acquaintances. For 309 respondents (20.6%) their own health was a source of stress, and for 423 (28.2%) it was the health of family or friends. Finances were a source of stress for 299 respondents (19.9%); 246 were stressed about opportunities to play sports (16.4%); for 361 respondents (24.1%) the stressors included the limited possibility to develop their personal interests.

Due to fears of an infection, 49.1% ($N = 736$) of respondents had to refrain from contacts with people from their support group. Four hundred thirty-four (28.9% of the total number of respondents) indicated that they had to limit or refrain from contacts with 1-2 supporters, and 285 (19%) with 3-5 supporters.

Experience of life changes within the previous 3 months was also investigated. 53.7% ($N = 806$) of the respondents experienced no life changes other than the pandemic itself and the limitations connected with it (such as remote learning). The most numerous group of respondents indicated the following significant changes in the period of the previous 3 months: problems at school ($N = 366$; 24.4%); breaking up of friendships ($N = 255$; 17%); death of a family member/friend in the case of 132 respondents (8.8%); serious illness of a loved one – 149 respondents (9.9%); own serious illness or health problems – 78, i.e., 5.2% of the respondents (Table 2).

In terms of coping with stress, the respondents indicated the following coping methods/strategies: 76.7% ($N = 1,151$) listened to music; 68.8% ($N = 1,032$) talked to friends, best friends, partner (including talking on the phone, via messengers and social media); 660 (44%) slept a lot; 37.1% ($N = 557$) played video games (on a console or computer); 497 (33.1%) developed personal interests or hobbies; 28.3% ($N = 425$) talked to parents; 403 (26.9%) avoided talking about the coronavirus; 396 (26.4%) played sports; 358 (23.9%) read books; 299 (19.9%) used psychoactive substances (alcohol, drugs, nicotine); 295 (19.7%) spent time in nature (in a park or forest);

Table 1. Socio-demographic and health characteristics of the study sample ($N = 1500$)

Sociodemographics	Category	Frequency
Gender	Female	987 (65.8%)
	Male	499 (33.3%)
	Other	14 (0.9%)
School level	Gap year	1 (0.1%)
	General secondary school	916 (61.1%)
	Technical secondary school	545 (36.3%)
	Tertiary school	12 (0.8%)
	Post-secondary school/vocational secondary school	26 (1.7%)
Place of residence	Village	577 (38.5%)
	Small town (< 20,000 inhabitants)	166 (11.1%)
	Medium-sized town (20,000-100,000 inhabitants)	270 (18.0%)
	Large town (100,000-350,000 inhabitants)	131 (8.7%)
	Large city (> 350,000 inhabitants)	177 (11.8%)
	Capital of Poland (Warsaw, 1,789,620 inhabitants)	179 (11.9%)
Age	Mean (SD)	18.30 (0.56%)
	Median	18
	Min-max	18-23
	Q1; Q3	18; 19
Health status	Category	Frequency
Do you have any chronic illnesses?	No, I am healthy	1077 (71.8%)
	No, but I am disabled	10 (0.7%)
	Yes, a physical illness (e.g. diabetes, heart disease)	101 (6.7%)
	Yes, a mental illness (e.g. anxiety disorder, depression)	158 (10.5%)
	Don't know, I am in the process of being diagnosed for a physical or mental illness	101 (6.7%)
	Yes, both physical and mental illnesses	53 (3.5%)

218 (14.5%) talked to their siblings; 162 (10.8%) took care of nutrition; 152 (10.1%) learned about mental health, coping, emotions; 145 (9.7%) talked to a trusted person; 100 (6.7%) used the help of a mental health care professional; 4.5% ($N = 67$) did relaxation workshops, breathing exercises, yoga, meditation; 2.7% ($N = 40$) talked to a teacher, coach or priest; 2.7% (40) talked to their class

Table 2. The strongest stressors according to young people in Poland (N = 1500)

Stressor	Frequency
Driver's test	7 (0.5%)
Hopelessness/ loneliness/lack of motivation/ emotional problems/fear of the future or/and wasting time	10 (0.7%)
School-leaving exam/studies/work/future after graduation	43 (2.9%)
Political situation*	5 (0.3%)
Pandemic of COVID-19	403 (26.9%)
Limited opportunities to:	
Get out of the house	712 (47.5%)
Meet with friends/boyfriend/girlfriend/family	774 (51.6%)
Do sports	246 (16.4%)
Develop interests	361 (24.1%)
Distance learning	868 (57.9%)
Relationships with:	
One parent	159 (10.6%)
Both parents	168 (11.2%)
Siblings	111 (7.4%)
Boyfriend/girlfriend	175 (11.7%)
Closest friend	233 (15.5%)
Classmates	171 (11.4%)
Acquaintances	301 (20.1%)
Own health	309 (20.6%)
Own/family's/friends' health	423 (28.2%)
School problems, difficulties with teachers	380 (25.3%)
Learning, performance at school	717 (47.8%)
Family's and own finances	299 (19.9%)
Other	13 (0.9%)

*During the pandemic, the Polish parliament adopted a ban on abortion in the case of foetal abnormalities. It led to strikes called "war on women". People protested against depriving Polish women of their right to choose. This is known as the "hell of women".

teacher, and only 2% (N = 30) talked to a school counsellor or psychologist. 223 (14.9%) of the respondents used psychological care during the pandemic; 149 (9.9%) used psychiatric care. At the same time, only 73 people indicated the pandemic to be the reason they were seeking psychological help (4.9% of all respondents) (Table 3).

Risk and protective factors of depression

First, logistic regression analysis was performed to verify the possibility of predicting depression among young adults based on the following predictors: sex, age, school type and place of residence (Table 4). The overall model was statistically significant when compared to the null model, ($\chi^2(11) = 86.748, p < 0.001$), explained about 7.5% of the variation of depression (Nagelkerke R^2) and correctly predicted 61.2% of depression cases.

Males were approximately half as much at risk of depression symptoms, marked as item 6 in the question-

Table 3. Coping with stress among young people in Poland during the pandemic (N = 1500)

Ways of coping with stress	Frequency
Taking care of a pet	4 (0.3%)
Working/studying more	12 (0.8%)
Crying	3 (0.2%)
Talking to:	
Parents	425 (28.3%)
Siblings	218 (14.5%)
A close relative	145 (9.7%)
Acquaintances, friends, partner (by phone, messengers, social media)	1032 (68.8%)
A teacher/coach/priest	40 (2.7%)
A class teacher	40 (2.7%)
The school counsellor/psychologist	30 (2%)
Playing games (computer, console)	557 (37.1%)
Listening to music	1151 (76.7%)
Sports	396 (26.4%)
Maintaining a diet	162 (10.8%)
Sleeping a lot	660 (44%)
Avoiding information on coronavirus	403 (26.9%)
Using psychoactive substances (alcohol, drugs, nicotine)	299 (19.9%)
Reading books	358 (23.9%)
Reading, learning about mental health, emotions, coping	152 (10.1%)
Pursuing hobbies/interests	497 (33.1%)
Contact with nature (park, forest)	295 (19.7%)
Mental health professionals	101 (6.7%)
Relaxation, breathing, yoga, meditation etc.	67 (4.5%)
Other	29 (1.9%)
Not coping	15 (1%)

naire, than females (OR = 0.466; 95% BCa CI: -0.995 to -0.550; $p < 0.001$). The risk was significantly higher among general secondary school students than technical secondary school students (OR = 0.596; 95% BCa CI: -0.774 to -0.254) and about 7 times higher than among tertiary students (OR = 0.136; 95% BCa CI: -21.896 to -0.718). Young adults living in a very big city were at about 50% higher risk than those living in the countryside (OR = 1.57; 95% BCa CI: 0.082-0.816).

The stressors that were significant predictors of a higher score in the screening test for depression included: distance learning (OR = 1.563; 95% BCa CI: 0.180-0.726), school problems/difficulties with teachers (OR = 2.251; 95% BCa CI: 0.494-1.148), learning/performance at school (OR = 2.067; 95% BCa CI: 0.444-1.018). Serious illness or health problems were also found to be a significant predictor of a higher score on the KADS scale (OR = 2.438; 95% BCa CI: 0.558-1.275, see Table 5).

Table 4. Summary of logistic regression analysis with bootstrap method (1,000 samples) for socio-demographic characteristics predicting depression among young people in Poland (KADS) (N = 1500)

DV: Depression (KADS)	B	SE	Wald	df	p	Exp(B)*	95% BCa CI	
							Lower	Upper
(constant)	-1.566	2.449	0.480	1	0.500	0.209	-6.914	3.120
Sex								
Female (ref.)								
Male	-0.764	0.117	44.553	1	< 0.001	0.466	-0.995	-0.550
Other	0.017	1.449	0.001	1	0.966	1.017	-1.353	1.773
Age	0.123	0.136	0.958	1	0.360	1.130	-0.131	0.408
School level:								
General secondary (ref.)								
Technical secondary	-0.517	0.148	12.774	1	< 0.001	0.596	-0.774	-0.254
Tertiary	-1.992	4.455	7.049	1	0.009	0.136	-21.896	-0.718
Post-/vocational secondary	-0.383	0.455	0.866	1	0.389	0.682	-1.267	0.507
Place of residence:								
Village (ref.)								
Small town (< 20 k inh.)	-0.113	0.194	0.389	1	0.529	0.893	-0.537	0.280
Medium-sized town (20-100 k inh.)	0.022	0.155	0.021	1	0.891	1.023	-0.274	0.317
Large town (100-350 k inh.)	0.047	0.206	0.054	1	0.813	1.048	-0.342	0.471
Large city (> 350 k inh.)	0.453	0.186	5.940	1	0.013	1.573	0.082	0.816
Capital of Poland (Warsaw, 1,789,620 inh.)	0.120	0.190	0.396	1	0.517	1.127	-0.248	0.533

BCa CI - Bootstrap Bias-Corrected confidence interval

Hosmer & Lemeshow test: $\chi^2(8) = 6.048$; $p = 0.642$; Classification accuracy: 61.2%; Nagelkerke $R^2 = 0.075$; $\chi^2(11) = 86.748$; $p < 0.001$

Difficult and demanding relations with other people were an important risk factor for depression – these relations included not only parents, but also friends and teachers. The strongest relational factor which was a predictor of depression symptoms was a stressful relationship with one parent (OR = 2.643; 95% BCa CI: 0.509-1.483) or both parents (OR = 3.937; 95% BCa CI: 0.821-2.092). Relations with a boyfriend/girlfriend (OR = 2.240; 95% BCa CI: 0.323-1.363), the closest friend (OR = 1.751; 95% BCa CI: 0.140-0.992), and with friends from outside of school were also risk factors for depression symptoms (OR = 2.134; 95% BCa CI: 0.375-1.225). The model including stressors was statistically significant when compared to the null model, ($\chi^2(22) = 415.721$; $p < 0.001$), explained about 32.5% of the variation of depression (Nagelkerke R^2) and correctly predicted 71.6% of depression cases.

In addition, a higher risk of depression symptoms was connected with such coping strategies as: use of psychoactive substances (alcohol, drugs, nicotine) (OR = 2.390; 95% BCa CI: 0.540-1.255), sleeping a lot (OR = 1.488; 95% BCa CI: 0.126-0.643), listening to music (OR = 1.362; 95% BCa CI: 0.013-0.583), learning about mental health, emotions, coping (OR = 2.451; 95% BCa CI: 0.476-1.418), use of mental health care professionals' help (OR = 3.643; 95% BCa CI: 0.540-1.255; 0.700-2.116) (Table 6).

A lower risk of depression symptoms was seen among young people who used the following coping strategies: talking to parents (OR = 0.541; 95% BCa CI: -0.880 to

-0.337), and development of personal interests, hobbies (OR = 0.598; 95% BCa CI: -0.770 to -0.247). In turn, people who coped by playing sports had a lower risk of depression (OR = 0.607; 95% BCa CI: -0.767 to -0.246). This model, concerning coping strategies, was statistically significant when compared to the null model, ($\chi^2(25) = 228.961$; $p < 0.001$), explained about 19% of the variation of depression (Nagelkerke R^2) and correctly predicted 65.8% of depression cases.

DISCUSSION

This is one of the first studies relating to the general population of very young adults in Poland during the pandemic and, at the same time, the only one that examined the risk factors and protective factors in that population. The majority of previous studies were focused on university-level students or attempted to show the impact of the pandemic on the younger group [13, 17-19]. This study focuses on younger adults – the majority of respondents were 18-year-olds who were still at school.

Attention should be paid to the fact that most of the studies compared in this paper indicate much lower depression ratios in the younger age-group. This concerns, in particular, the comparison with China. The scores obtained in the other European studies are similar to the ones in Poland [20, 27-29]. The results of this study are identical to the ones obtained in the studies with the participation of young

Table 5. Summary of logistic regression analysis with bootstrap method (1000 samples) for the strongest stressors according to young people in Poland as predictors of depression (KADS) ($N = 1500$)

DV: Depression (KADS)	B	SE	Wald	df	p	Exp(B)	95% BCa CI	
							Lower	Upper
(constant)	-1.223	0.130	90.973	1	0.001	0.294	-1.465	-1.031
Stressors (no = base)								
Driver's test	0.128	7.163	0.022	1	0.743	1.136	-20.049	1.576
School-leaving exam/studies/work/future after graduation	0.534	0.396	2.237	1	0.152	1.705	-0.252	1.377
Political situation*	0.340	8.844	0.112	1	0.464	1.405	-20.331	20.791
Pandemic of COVID-19	0.324	0.159	4.693	1	0.042	1.382	-0.005	0.693
Limited opportunities to:								
Get out of the house	0.109	0.144	0.603	1	0.426	1.115	-0.191	0.393
Meet with friends/boyfriend/girlfriend/family	-0.129	0.139	0.855	1	0.325	0.879	-0.377	0.120
Do sports	-0.310	0.183	3.007	1	0.077	0.733	-0.660	0.040
Develop interests	-0.077	0.163	0.228	1	0.643	0.926	-0.407	0.273
Distance learning	0.447	0.129	12.335	1	0.001	1.563	0.180	0.726
Relationships with:								
One parent	0.972	0.227	17.869	1	0.001	2.643	0.509	1.483
Both parents	1.370	0.284	26.062	1	0.001	3.937	0.821	2.092
Siblings	-0.153	0.322	0.279	1	0.629	0.858	-0.864	0.549
Boyfriend/girlfriend	0.806	0.260	12.613	1	0.002	2.240	0.323	1.363
Closest friend	0.560	0.214	7.771	1	0.008	1.751	0.140	0.992
Classmates	-0.231	0.221	1.034	1	0.296	0.794	-0.643	0.219
Acquaintances	0.758	0.186	17.116	1	0.001	2.134	0.375	1.225
Own health	0.891	0.181	26.092	1	0.001	2.438	0.558	1.275
Own/family's/friends' health	0.158	0.155	1.188	1	0.301	1.172	-0.190	0.501
School problems, difficulties with teachers	0.811	0.165	24.641	1	0.001	2.251	0.494	1.148
Learning, performance at school	0.726	0.133	31.311	1	0.001	2.067	0.444	1.018
Family's and own finances	0.272	0.177	2.549	1	0.104	1.313	-0.091	0.671
Other	2.132	4.520	9.695	1	0.002	8.435	0.661	22.184

During the pandemic, the Polish parliament adopted a ban on abortion in the case of foetal abnormalities. It led to strikes called "war on women". People protested against depriving Polish women of their right to choose. This is known as the "hell of women".

BCa CI – Bootstrap Bias-Corrected confidence interval

Hosmer & Lemeshow test: $\chi^2(8) = 12.886$; $p = 0.116$; Classification accuracy: 71.6%; Nagelkerke $R^2 = 0.325$; $\chi^2(22) = 415.721$; $p < 0.001$

adults, mostly university-level students of other European countries; however, no other study paid attention to very young adults aged 18. The central role can be attributed to the regional differences existing with respect to the psychological health of the general public and the availability of medical facilities and mental health services. Other factors influencing mental health during the pandemic were the degrees of outbreak severity, national economy and government preparedness. The range of mental health preventive strategies implemented and proper dissemination of COVID-related information are an important contribution. Additionally, the stage of the outbreak in each region can also affect the psychological responses of the public.

Until now, the most comprehensive study concerning the mental health of young adults was carried out in China, where Wang *et al.* [30] conducted a large cross-sectional

online survey. The prevalence of anxiety and depression symptoms was 7.7% (95% CI: 7.5-8.0%) and 12.2% (95% CI: 11.9-12.5%), respectively. Compared with students who reported not to have any cases of infection or suspected infection in family members and relatives, those who reported that they had confirmed (OR = 4.06; 95% CI: 1.62-10.19; $p = 0.003$) and suspected (OR = 2.11; 95% CI: 1.11-4.00; $p = 0.023$) cases in family members and relatives were at a higher risk of depression symptoms. Ma *et al.* [31] conducted a survey with the participation of 746,217 college students, of whom 55.6% were female. Of the participants included in the sample, 45% had probable acute stress, depressive or anxiety symptoms with a prevalence of 34.9%, 21.1% and 11.0%, respectively.

So far, few studies on depression symptoms and predictors thereof have been carried out in Europe. A French

Table 6. Summary of logistic regression analysis with bootstrap method (1,000 samples) for ways of coping with stress as predictors of depression (KADS) ($N = 1500$)

DV: Depression (KADS)	B	SE	Wald	df	p	Exp(B)	95% BCa CI	
							Lower	Upper
(constant)	0.076	0.149	0.264	1	0.608	1.079	-0.204	0.368
Ways of coping (no = base)								
Crying	-0.189	13.382	0.019	1	0.378	0.828	-21.523	20.893
Taking care of a pet	0.656	11.116	0.282	1	0.270	1.928	-20.832	21.349
Working/studying more	-0.212	1.932	0.119	1	0.704	0.809	-1.609	1.093
Talking to:								
Parents	-0.614	0.137	18.676	1	0.001	0.541	-0.880	-0.337
Siblings	-0.055	0.187	0.091	1	0.755	0.946	-0.394	0.244
A close relative	-0.184	0.214	0.833	1	0.387	0.832	-0.641	0.243
Acquaintances, friends, partner (by phone, messengers, social media)	0.026	0.123	0.042	1	0.835	1.026	-0.239	0.286
A teacher/coach/priest	-0.050	0.389	0.019	1	0.891	0.951	-0.812	0.720
A class teacher	-0.160	0.437	0.187	1	0.713	0.852	-1.045	0.677
The school counsellor/psychologist	0.692	1.263	2.146	1	0.173	1.997	-0.461	2.810
Playing games (computer, console)	-0.219	0.121	3.257	1	0.060	0.804	-0.455	-0.003
Listening to music	0.309	0.142	4.726	1	0.030	1.362	0.013	0.583
Sports	-0.500	0.140	12.675	1	0.002	0.607	-0.767	-0.246
Keeping a diet	-0.154	0.199	0.606	1	0.454	0.857	-0.500	0.250
Sleeping a lot	0.397	0.120	11.546	1	0.002	1.488	0.126	0.643
Avoiding information on coronavirus	0.198	0.127	2.331	1	0.115	1.219	-0.053	0.431
Using psychoactive substances (alcohol, drugs, nicotine)	0.871	0.164	31.255	1	0.001	2.390	0.540	1.255
Reading books	-0.113	0.143	0.657	1	0.433	0.893	-0.369	.156
Reading, learning about mental health, emotions, coping	0.896	0.225	16.706	1	0.001	2.451	0.476	1.418
Pursuing hobbies/interests	-0.514	0.132	15.215	1	0.001	0.598	-0.770	-0.247
Contact with nature (park, forest)	-0.106	0.156	0.477	1	0.482	0.899	-0.413	0.180
Mental health professionals	1.293	0.304	19.960	1	0.001	3.643	0.700	2.116
Relaxation, breathing, yoga, meditation etc.	0.343	0.346	1.262	1	0.297	1.409	-0.340	1.128
Other	1.052	0.844	5.295	1	0.014	2.863	0.005	3.141
Not coping	2.401	11.180	5.231	1	0.017	11.036	0.735	37.195

BCa CI – Bootstrap Bias-Corrected confidence interval

Hosmer & Lemeshow test: $\chi^2(8) = 4.907$; $p = 0.768$; Classification accuracy: 65.8%. Nagelkerke $R^2 = 0.190$; $\chi^2(25) = 228.961$; $p < 0.001$

study [27] indicates that depression is observed in 43% of the student population. At the same time, the scores for anxiety (39.19%) and distress (42.94%) are much higher than those previously observed in this population. 14.86% of respondents reported self-harm or suicidal thoughts. A Swiss study [32] indicated that undergraduate students who worry more about their family and friends are more likely to become more depressed ($b = 1.54$, $t(130) = 2.68$, $p = 0.008$) and more stressed ($b = 0.96$, $t(159) = 2.19$, $p = 0.030$). Worries about one’s future career contributed to higher levels of anxiousness ($b = 0.45$, $t(164) = 2.22$, $p = 0.027$) and stress ($b = 1.36$, $t(159) = 3.69$, $p < 0.001$). The presence of personal problems that were usually suppressed was a strong positive predictor of an increase in depression ($b = 4.10$, $t(130) = 6.03$, $p < 0.001$), anxiety ($b = 1.49$, $t(164) = 6.31$, $p < 0.001$) and stress ($b = 0.93$, $t(159) = 2.01$,

$p = 0.047$). COVID-19-related factors, such as social isolation and worries about the economy, did not predict changes in mental health in this multivariate regression model. In Italy, Delmastro and Zamariola [28] assessed the psychological impact of COVID-19 on 6,700 Italian individuals, representative of the Italian population (in terms of age, gender and geographical areas, revealing higher scores of depressive symptoms in females, younger adults, people reporting professional uncertainty and lower socioeconomic status). They focused on young adults (16-24) and adults (25+), and the field data collection was conducted in June 2020. Younger individuals are confirmed to be more exposed to negative mood, indicative of mental distress (the coefficient of age is negative and significant at 99%), and so are women (coefficient = 0.212 and SD = 0.0286). Greek students ($N = 1000$; age: 22.07 ± 3.30 years;

68.01% females) reported a change with an increase in anxiety (73.0%), depression (60.9%) and overall suicidality (20.2%); quantity of sleep increased in 66.3% (remained the same in 19.3%) but quality worsened in 43.0% (same in 39.1%). Sexual life worsened in 38.6% (same in 55.3%). Quality of life worsened in 57.0% (same in 27.9%) [29].

The associated risk and protective factors indicated in this study shed light on the policy targeting young adults. Firstly, more attention should be paid and assistance should be prioritized for the very young adult population (both secondary school and university students). Secondly, governments must ensure easily accessible mental health services for young adults, especially in the periods of prolonged quarantine, lockdown or distance learning. Thirdly, schools and universities should implement long-term mental health programs at least with regard to stress and coping (optimally maintaining a healthy lifestyle, including diet, exercise, sleep; staying away from COVID-19 related news, keeping in touch with friends and family, relationship problem-solving).

There are some limitations to our study that should be noted. The first limitation is the sampling technique used. It relies on digital infrastructure and voluntary participation, which increases selection bias. People with poor internet accessibility were likely to have been excluded

from the study, which created a selection bias in the population studied. The second limitation of this study is the cross-sectional design of the survey, as there was no follow-up period for the participants.

CONCLUSIONS

To the best of our knowledge, this study is the first Polish research to examine the predictors of young adults' depression during the COVID-19 outbreak. Hence, it highlights some important associated risk factors and provides suggestions for addressing the mental health crisis. Also see a broader discussion of this issue elsewhere [22].

One of the strengths of this survey is that it is one of the very first concerning young adults' mental health during the pandemic. Moreover, we studied the factors relating to stress in detail, by separating the COVID-19-related-stressors and stressors typical for this age group. At the same time, we looked into the coping strategies.

To sum up, our findings suggest that the COVID-19 outbreak and online learning have made a significant impact on the mental health of young adults. New policies and guidelines in this sphere would help mitigate some of the negative effects and prepare educators and students for future health crises.

Conflict of interest

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