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Article

Self-Esteem and Occupational Factors as Predictors of the Incidence of Anxiety and Depression among Health Workers during the COVID-19 Pandemics in Latvia

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Abstract: The prevalence of depression and anxiety among healthcare workers (HCWs) during the Covid-19 pandemics is high. The aim of the study is to identify the importance of self-esteem and occupational factors in association with the incidence of depression and anxiety among HCWs through a longitudinal cohort study during the Covid-19 pandemics in Latvia. Participants were interviewed repeatedly seven times during the Covid-19 pandemics. 322 participants were included in the data analysis for depression and 352 for anxiety. Low self-esteem and working in the general practitioner's office is associated with the incidence of depression and anxiety. Undergraduate education and direct contact with Covid-19 patients are associated with the incidence of depression. The risk of anxiety decreases by 1% each year among HCWs. Our study shows the importance of personality factors of HCWs during the Covid-19 pandemics.

Keywords: self-esteem; occupational factors; depression; anxiety; healthcare workers; COVID-19

1. Introduction

The meta-analysis of cross-sectional studies shows a high prevalence of depression and anxiety among health care workers (HCWs) during the Covid-19 pandemic. Globally, anxiety is more prevalent than depression among HCWs. [1,2].

The prevalence of depression and anxiety among HCWs increases in Covid-19 outbreaks [3], however, longitudinal studies from Italy show controversial data. One study reports an increase in the rate of stress and depression over time but remains at a subclinical level, [4] another study shows a decrease in psychiatric symptoms for a 1-year period. [5]

Occupational factors for HCWs are well studied in the Covid-19 pandemic. HCWs who work in high-risk units and are in direct contact with Covid-19 patients are at higher risk of insomnia, sleep disorders, depression, anxiety, and post-traumatic stress disorder (PTSD). [3]. Being a nurse is a risk factor for anxiety, depression, and insomnia. [4–6]. It is known sex to be an important issue in mental health. In some cross-sectional studies, HCWs who are woman more frequently experience anxiety and depression, [3] but Fattori et al. report opposite data: during the pandemic the importance of sex decreases [5].

The impact of personality factors such as self-esteem on poor mental health outcomes has not been widely studied during the Covid-19 pandemic. It is known that previous mental health status, coping strategies, perceived social support, relationship, and living status are associated with mental health outcomes among HCWs during the Covid-19 pandemic [4]. Self-esteem is an important factor for professional skills and for workplace choice- nurses with high self-esteem want to change their workplace to better if current workplace stress is too high. [7] There are studies that confirm the association of self-esteem with depression symptoms, but longitudinal studies are still needed to explore whether low self-esteem is a predictor of poor mental health outcome among HCWs [8].

The aim of the study is to identify the association of self-esteem and occupational factors with the incidence of depression and anxiety among HCWs through a longitudinal cohort study during the Covid-19 pandemics in Latvia.

2. Materials and Methods

Ethics

This study was approved on 20 April 2020 by the Research Ethics Committee of Riga Stradiņš University, Latvia, protocol number 6-1/04/1. Electronic or written informed consent for participation in the study was obtained from each participant. Participants could withdraw themselves from the survey at any time without providing any justification.

Study design and sampling

This study is part of a web-based longitudinal observational study to examine mental health of HCWs during the Covid-19 pandemic in Latvia. Participants were interviewed repeatedly seven times during the Covid-19 pandemics with fixed time intervals: T0- from 28 April 2020 till 2 June 2020, T1- 3 months after T0, T2- 6 months after T0, T3- 10 months after T0, T4- 13 months after T0, T5- 16 months after T0, T6- 19 months after T0. The participants were selected by a nonprobability sampling approach. Physicians, physician assistants, nurses and other health care workers (nursing assistants, physiotherapists, dental technicians, medical students, etc.) were recruited in Latvia from intensive care departments and patient admission departments from three university hospitals and fourteen regional hospitals, as well as from state emergency medical services (SEMS), general practitioners practices (GP) and Riga Stradiņš University's Institute of Stomatology (Stomatology). This study was carried out using self-reported questionnaires. The first interview (T0) was in 2 formats: paper format and REDCap web-based format; the format depended on the internal rules of the specific medical institution based on the limitations of personal contact due to COVID-19. The next six questionnaires for the interviews (T1-T6) were sent electronically to participants who agreed to continue participating in the study and provided an email address; format was a self-reported questionnaire based on the RED-Cap web site. Participation was on a voluntary basis.

Study population and it's follow-up

In the T0, answers from 864 HCWs were obtained. 84,1% of the respondents were women, median age 40 (IQR 29.0-54.0), 41,5% were physicians and 45,5% nurses or physician assistants, 44,7% worked in hospitals and 22,7% in the GP's office. The prevalence of depression and anxiety was 24,8% and 17,2%, respectively. The results related to the T0 evaluation have been published elsewhere [8]. For the longitudinal study, 542 HCWs were excluded from the data analysis for depression symptoms and 512 HCWs were excluded from the data analysis for anxiety symptoms because they did not meet the inclusion criteria. Respondents were analysed until 1) incidence of depression or anxiety (PHQ-9 ≥ 10; GAD-7 ≥ 10); or 2)last participation in the study without symptoms of depression or anxiety (PHQ-9 < 10 in all interviews; GAD-7 < 10 in all interviews).

Inclusion criteria

There were 3 inclusion criteria for follow-up: 1) HCWs who worked as healthcare workers in the previously stated health care institutions during the study; 2) In the first interview (T0), HCW did not have symptoms of depression or anxiety (PHQ-9<10; GAD<10); 3) HCW participated in at least 2 interviews.

Measurement tools

Participants reported their demographic parameters, work-related information, contacts with COVID-19 positive patients, and three standardised questionnaires that evaluated symptoms of anxiety (GAD-7), depression (PHQ-9) and self-esteem (Rosenberg's Self-esteem scale) in T0-T6.

Each survey included individual characteristics such as sex (male/female), age, education (≤ undergraduate or ≥ graduate), occupation (physician, physician assistant or nurse, other), work experience in years, workplace (hospital, SEMS, GP, Stomatology), working hours during the previous week and direct-contact with patients with a suspected or confirmed COVID-19 infection at the interview time point.

Self-esteem was assessed using the Rosenberg Self-Esteem Scale (RSS). A scale measures global self-worth by positive and negative feelings about self, and consists of 10 questions measured on a Likert scale. The total score range is 10-40. The questionnaire results were classified as categorial variables- low-level (10-25), medium-level (26-29) and high level (30–40) self-esteem[9,10].

Current mental status was assessed using assessment tools in the Latvian language. A validated Latvian version of the 9 item Patient Health Questionnaire (PHQ-9; range, 0–27) was used to assess the symptoms of depression. The results of the questionnaire were categorised as a dichotomous variable. The cut-off score for clinically significant depression was 10. [11,12]

The 7 item Generalized Anxiety Disorder (GAD-7) scale (range 0–21) was used to assess anxiety symptoms [13,14] The results of the questionnaire were categorised as a dichotomous variable. The cut-off score for clinically significant anxiety was 10 [15].

Data analysis.

In the present study, we analysed the association of demographic factors, occupational factors, and self-esteem measured in T0 with the incidence of depression and anxiety during the Covid-19 pandemic.

Incidence density was calculated using the MedCalc calculator [16]. The number of depression and anxiety events and person-months for the calculation of the incidence density were obtained using IBM SPSS Statistics (Version 29.0.0.0).

As this observation study is replicated across time introducing random variable, the Generalized Linear Mixed Model (GLMM) was used to identify factors associated with depression and anxiety incidence among HCW. Because the response variables (depression and anxiety) were categorized as dichotomous variables, the binomial logistic approach with the logit link function model was applied. The profession, age, work experience, workplace, education, direct contact, sex, working hours, and self-esteem were used as explanatory variables. All possible models including the null model and interactions were calculated. To select the best model, the Akaike Information Criterion (AIC) was used. Statistical data analysis was conducted using the jamovi program with "gamlj" module [17–19]

3. Results

In T0 322 and 352 participants were included in the data analysis for depression and anxiety, respectively, the parameters of the baseline and follow-up samples are in Tables 1 and 2 .

Table 1. Descriptive characteristics for baseline and follow-up samples for the analysis of depression symptoms.

	T0 (n=322), n(%)	T1 (n=273), n(%)	T2(n=265), n(%)	T3(n=224), n(%)	T4(n=201), n(%)	T5(n=206), n(%)	T6(n=166), n(%)
Sex							
Women	278 (87.1)	237 (87.1)	230 (87.5)	202 (90.6)	179 (89.5)	184 (90.2)	150 (90.9)
Men	41 (12.7)	35 (12.9)	33 (12.5)	21 (9.4)	21 (10.5)	20 (9.8)	15 (9.1)
Age							
19-29	74 (23.1)	71 (26.0)	64 (24.2)	48 (21.5)	42 (21.0)	41 (20.1)	29 (17.7)
30-39	66 (20.6)	58 (21.2)	60 (22.6)	49 (22.0)	47 (23.5)	48 (23.5)	34 (20.7)
40-49	57 (17.8)	50 (18.3)	45 (17.0)	45 (20.2)	39 (19.5)	41 (20.1)	36 (22.0)
50+	123 (38.4)	94 (34.3)	96 (36.2)	81 (36.3)	72 (36.0)	74 (36.3)	65 (39.6)
Education							
Undergraduate	55 (17.1)	46 (16.8)	42 (15.8)	33 (14.7)	24 (11.9)	26 (12.6)	18 (10.8)
Post-graduate	267 (82.9)	227 (83.2)	223 (84.2)	191 (85.3)	177 (88.1)	180 (87.4)	148 (89.2)
Occupation							
Physician	156 (48.4)	132 (48.4)	134 (50.6)	115 (51.3)	104 (51.7)	103 (50.0)	90 (54.2)
Nurse/ physician assistant	125 (38.8)	106 (38.8)	96 (36.2)	86 (38.4)	80 (39.8)	85 (41.3)	65 (39.2)
Other	41 (12.7)	35 (12.8)	35 (13.2)	23 (10.3)	17 (8.5)	18 (8.7)	11 (6.6)
Workplace							
Hospital and SEMS	223 (69.3)	187 (68.5)	180 (67.9)	150 (67.0)	132 (65.7)	133 (64.6)	103 (62.0)
GP	79 (24.5)	70 (25.6)	68 (25.7)	57 (25.4)	52 (25.9)	59 (28.6)	51 (30.7)
Stomatology	20 (6.2)	16 (5.9)	17 (6.4)	17 (7.6)	17 (8.5)	14 (6.8)	12 (7.2)

Working experience							
<5	59 (18.7)	57 (21.3)	49 (18.9)	35 (15.8)	27 (13.6)	29 (14.3)	16 (9.8)
5-10	66 (20.9)	57 (21.3)	61 (23.6)	47 (21.2)	44 (22.2)	45 (22.2)	34 (20.7)
11-20	55 (17.4)	49 (18.3)	45 (17.4)	42 (18.9)	40 (20.2)	40 (19.7)	30 (18.3)
21-30	53 (16.8)	45 (16.8)	47 (18.1)	40 (18.0)	38 (19.2)	38 (18.7)	35 (21.3)
>30	83 (26.3)	60 (22.4)	57 (22.0)	58 (26.1)	49 (24.7)	51 (25.1)	49 (29.9)
Working hours							
<40	75 (23.5)	52 (19.2)	44 (16.7)	29 (13.1)	26 (13.1)	36 (17.6)	22 (13.4)
40-48	161 (50.5)	116 (42.8)	100 (38.0)	87 (39.2)	89 (44.7)	74 (36.1)	67 (40.9)
>48	83 (26.0)	103 (38.0)	119 (45.2)	106 (47.7)	84 (42.2)	95 (46.3)	75 (45.7)
Direct contact with Covid-19	175 (54.5)	117 (42.9)	163 (61.5)	160 (71.4)	133 (66.2)	145 (70.4)	120 (72.3)
Self-esteem							
Low	22 (6.9)	27 (9.9)	24 (9.1)	30 (13.5)	24 (11.9)	32 (15.5)	24 (14.5)
Medium	44 (13.8)	40 (14.7)	54 (20.4)	42 (18.8)	36 (17.9)	37 (18.0)	26 (15.7)
High	254 (79.4)	206 (75.5)	187 (70.6)	151 (67.7)	141 (70.1)	137 (66.5)	116 (69.9)
Anxiety	20 (6.2)	24 (8.8)	39 (14.7)	41 (18.3)	24 (11.9)	45 (21.8)	35 (21.1)
Depression		30 (11.0)	49 (18.5)	68 (30.4)	43 (21.4)	51 (24.8)	40 (24.1)

Table 2. Descriptive characteristics for baseline and follow-up samples for the analysis of anxiety symptoms.

	T0 (n=352), n(%)	T1 (n=298), n(%)	T2(n=286), n(%)	T3(n=242), n(%)	T4(n=216), n(%)	T5(n=223), n(%)	T6(n=182), n(%)
Sex							
Women	301 (86.2)	256 (86.2)	246 (86.6)	218 (90.5)	190 (88.4)	200 (90.5)	164 (90.6)
Men	48 (13.8)	41 (13.8)	38 (13.4)	23 (9.5)	25 (11.6)	21 (9.5)	17 (9.4)
Age							

19-29	82 (23.5)	80 (26.9)	69 (24.2)	51 (21.3)	48 (22.4)	45 (20.5)	36 (20.1)
30-39	70 (20.1)	61 (20.5)	61 (21.4)	50 (20.8)	47 (22.0)	48 (21.8)	33 (18.4)
40-49	63 (18.1)	54 (18.2)	50 (17.5)	48 (20.0)	41 (19.2)	45 (20.5)	39 (21.8)
50+	134 (38.4)	102 (34.3)	105 (36.8)	91 (37.9)	78 (36.4)	82 (37.3)	71 (39.7)
Education							
Undergraduate	57 (16.2)	48 (16.1)	44 (15.4)	34 (14.0)	25 (11.6)	27 (12.1)	20 (11.0)
Post-graduate	295 (83.8)	250 (83.9)	242 (84.6)	208 (86.0)	191 (88.4)	196 (87.9)	162 (89.0)
Occupation							
Physician	172 (48.9)	148 (49.7)	146 (51.0)	128 (52.9)	113 (52.3)	115 (51.6)	100 (54.9)
Nurse/ physician assistant	139 (39.5)	115 (38.6)	105 (36.7)	92 (38.0)	86 (39.8)	90 (40.4)	69 (37.9)
Other	41 (11.6)	35 (11.7)	35 (12.2)	22 (9.1)	17 (7.9)	18 (8.1)	13 (7.1)
Workplace							
Hospital and SEMS	241 (68.5)	202 (67.8)	191 (66.8)	159 (65.7)	140 (64.8)	139 (62.3)	111 (61.0)
GP	90 (25.6)	79 (26.5)	77 (26.9)	66 (27.3)	58 (26.9)	69 (30.9)	58 (31.9)
Stomatology	21 (6.0)	17 (5.7)	18 (6.3)	17 (7.0)	18 (8.3)	15 (6.7)	13 (7.1)
Working experience							
<5	66 (19.0)	65 (22.2)	52 (18.5)	38 (15.8)	33 (15.4)	33 (14.9)	22 (12.2)
5-10	71 (20.5)	60 (20.5)	66 (23.5)	48 (20.0)	45 (21.0)	45 (20.4)	34 (18.8)
11-20	62 (17.9)	54 (18.4)	50 (17.8)	46 (19.2)	41 (19.2)	44 (19.9)	34 (18.8)
21-30	55 (15.9)	46 (15.7)	48 (17.1)	40 (16.7)	40 (18.7)	39 (17.6)	35 (19.3)
>30	93 (26.8)	68 (23.2)	65 (23.1)	68 (28.3)	55 (25.7)	60 (27.1)	56 (30.9)
Working hours							
<40	84 (24.1)	61 (20.6)	49 (17.3)	35 (14.5)	31 (14.5)	42 (18.9)	25 (13.9)
40-48	166 (47.6)	118 (39.9)	102 (35.9)	92 (38.2)	90 (42.1)	76 (34.2)	74 (41.1)
>48	99 (28.4)	117 (39.5)	133 (46.8)	114 (47.3)	93 (43.5)	104 (46.8)	81 (45.0)
Direct contact with Covid-19	191 (54.4)	131 (44.0)	174 (60.8)	173 (71.5)	143 (66.2)	153 (68.6)	135 (74.2)
Self-esteem							
Low	34 (9.7)	39 (13.1)	34 (11.9)	38 (15.8)	29 (13.4)	42 (18.8)	33 (18.1)
Medium	51 (14.6)	42 (14.1)	57 (19.9)	46 (19.1)	43 (19.9)	37 (16.6)	32 (17.6)
High	264 (75.6)	217 (72.8)	195 (68.2)	157 (65.1)	144 (66.7)	144 (64.6)	117 (64.3)
Anxiety		29 (9.7)	43 (15.0)	45 (18.6)	33 (15.3)	53 (23.8)	45 (24.7)
Depression	49 (13.9)	50 (16.8)	64 (22.4)	85 (35.1)	55 (25.5)	70 (31.4)	54 (29.7)

The incidence density of depression and anxiety was calculated (Tables 3 and 4). HCWs who worked in the hospital had lower depression rates compared to those who worked in GPs office. Age

older than 50 years, working experience greater than 20 years, and high self-esteem are protective factors for depression. Low self-esteem is a risk factor for anxiety. Age older than 50 years and working experience greater than 30 years are protective factors for anxiety. Other factors did not show any significant results in the incidence density analysis.

Table 3. Incidence density of depression symptoms.

	Total (n)	Depression (n (%))	Person-months	Incidence density (ID)	ID 95% CI	P values
Sex						
Women	278	111 (39.9)	3326	0.03	0.03 to 0.04	0.538
Men	41	16 (39.0)	409	0.04	0.02 to 0.06	
Occupation						
Physician*	156	67 (42.9)	1909	0.04	0.03 to 0.04	
Nurse/ physician assistant	125	46 (36.8)	1505	0.03	0.02 to 0.04	0.479
Other	41	15 (36.6)	359	0.04	0.02 to 0.07	0.541
Self-esteem						
Low	22	14 (63.6)	196	0.07	0.04 to 0.12	**<0.001**
Medium	44	28 (63.6)	420	0.07	0.04 to 0.10	**< 0.001**
High*	254	85 (33.5)	3132	0.03	0.02 to 0.03	
Age						
19-29*	74	33 (44.6)	720	0.05	0.03 to 0.06	
30-39	66	31 (47.0)	782	0.04	0.03 to 0.06	0.561
40-49	57	22 (38.6)	684	0.03	0.02 to 0.05	0.196
50+	123	41 (33.3)	1552	0.03	0.02 to 0.04	**0.017**
Working experience						
<5*	59	27 (45.8)	522	0.05	0.03 to 0.08	
5-10	66	31 (47.0)	725	0.04	0.03to 0.06	0.469
11-20	55	23 (41.8)	657	0.04	0.02 to 0.05	0.166
21-30	53	17 (32.1)	711	0.02	0.01 to 0.04	**0.011**
>30	83	28 (33.7)	1109	0.03	0.02 to 0.04	**0.007**
Workplace						
Hospital and SEMS	223	82 (36.8)	2575	0.03	0.03 to 0.04	0.109
GP*	79	40 (50.6)	923	0.04	0.03 to 0.06	
Stomatology	20	6 (30.0)	275	0.02	0.01 to 0.05	0.110
Education						
Undergraduate	55	18 (32.7)	555	0.03	0.02 to 0.05	0.836
Post-graduate	267	110 (41.2)	3218	0.03	0.03 to 0.04	

Direct contact with Covid-19 in T0						
No	146	58 (39.7)	1812	0.03	0.02 to 0.04	0.503
Yes	175	70 (40.0)	1942	0.04	0.03 to 0.05	
Direct contact with Covid-19 in T0-T6						
No	46	19 (41.3)	507	0.04	0.02 to 0.06	0.641
yes	276	109 (39.5)	3266	0.03	0.03 to 0.04	
Working hours						
<40*	74	29 (39.2)	853	0.03	0.02 to 0.05	
40-48	114	41 (36.0)	1348	0.03	0.02 to 0.04	0.646
>48	132	57 (43.2)	1547	0.04	0.03 to 0.05	0.724

* Reference.

Table 4. Incidence density for anxiety symptoms.

	Total (n)	Anxiety (n (%))	Person-months	Incidence density (ID)	ID 95% CI	P values
Sex						
Women	301	103 (34.2)	3842	0.03	0.02 to 0.03	0.500
Men	48	16 (33.3)	498	0.03	0.02 to 0.05	
Occupation						
Physician*	172	68 (39.5)	2219	0.03	0.02 to 0.04	
Nurse/ physician assistant	139	44 (31.7)	1762	0.02	0.02 to 0.03	0.289
Other	41	8 (19.5)	397	0.02	0.01 to 0.04	0.259
Self-esteem						
Low	34	21 (61.8)	293	0.07	0.04 to 0.11	**< 0.001**
Medium	51	20 (39.2)	569	0.04	0.02 to 0.05	0.061
High*	264	77 (29.2)	3491	0.02	0.02 to 0.03	
Age						
19-29*	82	30 (36.6)	848	0.04	0.02 to 0.05	
30-39	70	28 (40.0)	875	0.03	0.02 to 0.05	0.703
40-49	63	23 (36.5)	809	0.03	0.02 to 0.04	0.429
50+	134	37 (27.6)	1808	0.02	0.01 to 0.03	**0.024**
Working experience						
<5*	66	22 (33.3)	638	0.03	0.02 to 0.05	
5-10	71	28 (39.4)	837	0.03	0.02 to 0.05	0.915
11-20	62	23 (37.1)	789	0.03	0.02 to 0.04	0.573

21-30	55	19 (34.5)	773	0.02	0.02 to 0.04	0.277
>30	93	27 (29.0)	1291	0.02	0.01 to 0.03	0.079
Workplace						
Hospital and SEMS	241	74 (30.7)	2867	0.03	0.02 to 0.03	0.203
GP*	90	40 (44.4)	1208	0.03	0.02 to 0.05	
Stomatology	21	6 (28.6)	303	0.02	0.01 to 0.04	0.235
Education						
Undergraduate	57	16 (28.1)	600	0.03	0.02 to 0.04	0.906
Post-graduate	295	104 (35.3)	3778	0.03	0.02 to 0.03	
Direct contact with Covid-19 in T0						
No	160	55 (34.4)	2175	0.03	0.02 to 0.03	0.427
Yes	191	64 (33.5)	2187	0.03	0.02 to 0.04	
Direct contact with Covid-19 in T0-T6						
No	50	15 (30.0)	604	0.02	0.01 to 0.04	0.681
yes	302	105 (34.8)	3774	0.03	0.02 to 0.03	
Working hours						
<40*	84	27 (32.1)	1063	0.03	0.02 to 0.04	
40-48	117	38 (32.5)	1437	0.03	0.02 to 0.04	0.873
>48	150	55 (36.7)	1872	0.03	0.02 to 0.04	0.535

* Reference.

Generalized Linear Mixed Model (GLMM) was performed to identify factors influencing depression and anxiety incidence among HCW (Tables 4 and 5). Working in the GP's office was associated with a two-time higher risk of depression incidence compared to working in the hospital and SEMS. Participants with higher education had a 29% lower risk of depression. Those who had direct contact with Covid-19 patients had 31% greater risk for depression. Participants who had medium-level self-esteem in T0 had a 61% risk of depression and those who had low-level self-esteem in T0 had a 83% risk of depression.

Working in the GP's office was associated with a 2 times higher risk of anxiety incidence compared to working in the hospital and SEMS, but working in Stomatology was associated with a 44% lower risk of anxiety compared to participants who worked in the hospital and SEMS. Males had lower rates of anxiety incidence, but difference were not statistically significant. Those who had direct contact with Covid-19 patients had a higher risk of depression, but not statistically significant. Participants who had medium-level self-esteem at T0 had a 44% risk of anxiety and those who had low-level self-esteem at T0 had a 76% risk of anxiety. Being older every year lowered anxiety incidence rates by 1%.

Table 4. Fixed effects in generalized linear mixed models to identify factors influencing depression occurrence. Data were analysed by binomial logistic (with logit link function) generalized linear mixed modelling including time as random effect variable.

Parameter	Category	OR	95% CI of OR	z	p
Intercept		0.11	0.53 – 0.81	-3.96	<0.001
Workplace					
	GP – Hospital and SEMS*	2.04	1.67 – 2.49	6.99	<0.001
	Stomotology – Hospital and SEMS*	0.68	0.43 – 1.09	-1.58	0.114
Education					
	Postgraduate – Undergraduate*	0.71	0.55 – 0.91	-2.69	0.007
Direct contact					
	Yes – No*	1.31	1.09 – 1.57	2.82	0.005
Self-esteem					
	Moderate – Low*	0.39	0.30 – 0.51	-7.15	<0.001
	High – Low*	0.17	0.14 – 0.22	-15.79	<0.001

* Reference.

Table 5. Fixed effects in generalized linear mixed models to identify factors influencing anxiety occurrence. Data were analysed by binomial logistic (with logit link function) generalized linear mixed modelling including time as random effect variable.

Parameter	Category	OR	95% CI of OR	z	p
Intercept		0.32	0.25 – 0.40	-9.65	<0.001
Workplace					
	GP- Hospital*	2.06	1.67 – 2.55	6.64	<0.001
	Stomotology- Hospital*	0.56	0.32 – 0.97	-2.05	0.040
Gender					
	Male – Female*	0.76	0.55 – 1.05	-1.65	0.100
Direct contact					
	Yes – No*	1.18	0.97 – 1.43	1.61	0.107
Self-esteem					
	Moderate – Low*	0.56	0.43 – 0.73	-4.31	<0.001
	High – Low*	0.24	0.20 – 0.30	-12.38	<0.001
Age		0.99	0.98 – 0.99	-2.19	0.029

* Reference.

4. Discussion

To our knowledge this is the first study that measures HCWs mental health at seven different time points during Covid-19 pandemics. A study in Spain with a relatively small population shows an increase in depression and state anxiety level in follow-up after 6 months [20]. However, a study from New York State (USA) with follow-up after 1 year and a study from Italy with follow-up after 6 months showed a significant decrease in mental health problems during the first pandemic year [21,22]. A study from Italy with measurements at three different time points shows a mild increase in stress, depression, state anger, and emotional exhaustion [4]. In our study, we observed HCWs who did not have symptoms of depression and anxiety at the beginning of the Covid-19 pandemic.

In this population, the highest prevalence of depression and anxiety was in T3- it was the beginning of 2021- after the second Covid-19 wave in Latvia that was characterised by higher mortality rates compared to other countries of the European Union [23].

During Covid-19 pandemics, anxiety is more prevalent than depression. In a recent meta-analysis, the pooled prevalence of depression is 33-36% and the pooled prevalence of anxiety is 41-47% [1,2]. In Latvia it was opposite- depression rates were higher than anxiety rates among HCWs [8]. Frequent follow-up assessment in our study allowed us to observe incidence cases of depression and anxiety and to analyse how the factors assessed in T0 could potentially lead to poor mental health outcome.

To our knowledge, this is the first longitudinal study of mental health outcomes in relation to baseline self-esteem among HCWs during pandemics. Our study shows that self-esteem is a more important factor in the incidence of depression and anxiety than occupational factors. Low self-esteem at the beginning of the pandemic increased the risk of depression by 87% and the risk of anxiety by 76%. Studies from the general population report vulnerability model in depression- low self-esteem contributes to depression, during depression there is less erosion of self-esteem; low self-esteem relation with anxiety is more symmetrical [24]. We can see similarities in our study-the risk for depression is higher than the risk for anxiety among HCWs with low self-esteem. Another study researched the association between self-esteem and work-related quality of life among HCWs. Results showed that participants with lower self-esteem have a lower work-related quality of life; however, participants with high self-esteem also showed a lower work-related quality of life. This study helped highlight organisational problems in a workplace [25]. Because the health care system in Latvia has been underfunded for many years, human-recourse also suffer [23]. The HCWs as a risk group for lower self-esteem are already marked at the beginning of medical studies. Nursing students have lower self-esteem than business administration and finance students. The self-esteem of business administration and finance students increases with each study year, and no such correlation is observed in the population of nursing students [26]. Self-esteem is important in the professional life of future HCWs after studies. Primary health professionals with good leadership work more efficiently and are satisfied with their job, which results in better patient care [27].

The results of cross-sectional studies show sex differences for mental health disorders: women experience anxiety and depression more frequently during the Covid-19 pandemic than men. [3,6] The results of 2 longitudinal studies show higher anxiety rates among women, but no significant differences in depression[22,28]. The longitudinal study in Italy shows higher depression and anxiety rates for women, but the difference is not statistically significant [5]. A study from Canada also shows no sex differences for depression and anxiety [29]. In our study, we see similar results with previous study- sex is not statistically significant factor for depression and anxiety among HCWs. Sex is an important co-factor for the incidence of anxiety, but it is not statistically significant.

The effect of age on depression and anxiety among HCWs is inconsistent. Some studies show that age is not an important factor for anxiety and depression [4,5,29], however, another study found an association between younger age and depression among HCWs [28]. The results of our study show that the risk of depression is not associated with age, but the risk of anxiety decreases by 1% every year among HCWs. Incidence density analysis showed association between higher working experience and lower depression rates, but the effect diminished after performing GLMM.

Profession has been a widely studied factor for mental health issues among HCWs. Being a nurse is a well-known risk factor for depression and anxiety during the Covid-19 pandemic. [3,6]. Working as a doctor in the Dragioti and his colleague meta-analysis is associated with stress and PTSD. [6]. However, another meta-analysis shows that doctors, nurses, and older HCWs experience depression and anxiety more often. [2]. In our study there is no difference between professions for depression and anxiety incidence, however, we found the importance of education. HCWs with higher education the risk of depression is 29% lower than those with lower education. Some studies found nurses have higher anxiety rates than physicians [4,5], nurses and health care assistants have higher risk of anxiety and depression [23]. We can find two possible explanations why the profession is not significant for the incidence of depression and anxiety in our population, but education is. First, because of medical

education and working requirements in Latvia. There are undergraduate and postgraduate studies for the nurse and physician assistant profession. Second- the stratification group 'Other' includes a wide range of professions with different educational levels: nurses, physiotherapists, dental technicians, medical students, etc.

The results of studies show that working in a hospital is associated with a higher risk of mental health problems among HCWs. The results of the meta-analysis published in 2022 show similar results with the results published in 2023- the prevalence of depression is 28,4% and 28,5%, respectively; prevalence of anxiety is 29,9% and 28,7%, respectively. [3,6]. In our study, working in a GP is associated with twice the risk of developing depression or anxiety. Our data is consistent with study from France- in follow-up questionnaires burnout among GPs increases [31]. GPs in Latvia work mainly in private practices with small teams, less social support, and during the Covid-19 pandemics there were many new regulations and new duties for GPs, for example, remote consultations (by phone calls), management of the Covid-19 vaccination process [32]. In our study, working hours are not a significant factor for the incidence of anxiety or depression. A similar finding came from a study conducted in New York, USA. The study reports longer working hours among HCWs, but no association between mental health outcome [22]. We hypothesise that working conditions and workload during working hours are more important than working hours per se. For example, in our study we saw that GPs worked normal working hours, but their depression and anxiety rates were the highest. Our hypothesis is based on results from a study in Italy- depression and anxiety rates are positively associated with working in an environment with increased intensity of care [23]. Qualitative studies are needed to explore the burden in working hours.

Working conditions are important for mental health outcomes during the Covid-19 pandemics. Working in frontline, in high-risk Covid-19 units, in intensive/emergency medicine units, is associated with anxiety and depression [3,6,22,28]. However, some studies working in Covid-19 unit did not find significant for depression and anxiety[4,5]. Some studies show that direct contact with Covid-19 patients is associated with depression and anxiety [3]. In our study, we examined direct contact with Covid-19 patients. It is associated with a 30% higher risk of depression incidence during the Covid-19 pandemic. Direct contact with Covid-19 patients is an essential co-factor for the incidence of anxiety, but not statistically significant.

After analysing the data and research design in detail, we unfortunately concluded that here it is impossible to calculate the average time until depression or anxiety occurs. One of the main reasons is the size of the population and the frequency of the measurements. However, the measurement frequency helped to more accurately detect incidence cases of depression and anxiety. Dropout and length of questionnaire could introduce a sampling bias- there is a higher possibility that HCWs who suffer from negative mental health outcome feel additional burden to fill in the questionnaire. In comparison with studies from larger countries, our population size is comparable and representable. Working hours and workplace do not reflect on real workload- there is a need to explore workload by more detailed questionnaire.

5. Conclusions

Low self-esteem and working in the GP's office is associated with the incidence of depression and anxiety. Undergraduate education and direct contact with Covid-19 patients are associated with the incidence of depression. The risk of anxiety decreases by 1% every year among HCWs. Our study emerges the importance of personality factors of HCWs in today' health care system. It is important for the organisational and government level to search for possibilities to facilitate mental health of HCWs to ensure better quality of health care.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved on 20 April 2020 by the Research Ethics Committee of Riga Stradiņš University, Latvia, protocol number 6-1/04/1.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data is unavailable due to privacy and ethical restrictions.

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