



# Level of perceived stress among female emergency call operators during the first waves of the COVID-19 pandemic

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## Abstract

**Introduction and Objective.** Women comprise the majority of emergency call-takers and dispatchers (ECDs) in Poland. This workplace requires high mental resilience, control and tolerance of unpredictable events. Working during the first waves of the COVID-19 pandemic may have been particularly overburdening for female ECDs.

The aim of the study was to estimate the level of perceived life stress and its relationship with marital status, number of children, education level, workplace requirements, and number of shifts.

**Materials and Method.** A cross-sectional survey was conducted among 308 women working in 14 emergency call centres during the first waves of the COVID-19 pandemic. The survey employed The Perceived Stress Scale (PSS-10). A multivariate analysis of the effect of multiple variables on the quantitative variable was conducted using the linear regression method.

**Results.** The study confirmed the assumption about the high level of perceived stress during the first wave of the pandemic. It was revealed that for one-third of the women, the level of perceived stress was high and related to the number of on-call duties and the number of children at home. Higher education co-occurred with higher levels of women's helplessness, while being married co-occurred with its lower levels. There were differences in the level of stress due to workplace requirements.

**Conclusions.** Female ECDs face additional life stress because of the gender roles. In the analysis of the effects of the pandemic, the gender dimension should be taken into account in the assessment of public health.

## Key words

stress, female, COVID-19, pandemic, emergency call operators

## INTRODUCTION

Although public safety answering point (PSAP) workers are often the first responders to most critical life events, their work still receives insufficient attention in research. The life of a person waiting for help depends on quick and accurate decisions by the emergency call takers and dispatchers (ECD). The stressors occurring in the ECDs work include, among others, multitasking and balancing competing demands, unpredictability in the volume of calls, a lack of control over their workload, and less active roles in responding to emergencies [1]. A characteristic feature of the discussed profession is high staff turnover, which places additional strain on those employed due to staff shortages [2]. There are usually more women than men working in the ECD profession; the differences range from 8.4 – 92.6% in different countries [3–6].

In Poland, the Emergency Notification System is formed by 17 PSAPs for handling emergency calls directed to emergency number 112. For the PSAPs, work is organized in a shift

system equivalent to 12 hours a day, from 07:00 – 19:00, and from 19:00 – 07:00. Work in the PSAP is a profession that requires an employee's specific psychological predisposition which allow employee to perceive elements of their work environment in space and time optimally, and properly understand the meaning of information at the present moment and in the near future. The high level of perceived stress negatively affects these predispositions. Perceived stress is the attitude of people influenced by their participation in the appraisal progress and reflects the conjunction of a person with certain motives and beliefs with their environment [7]. An employee's perceived stress beliefs determine whether the expected action will be initiated, how much effort will be put into it, and how long they will be able to persevere in the face of obstacles and setbacks [7]. Perceived stress can lower individuals' confidence in their ability to perform certain activities or achieve specific results [8–10]. In a professional group of ECDs, the predominantly female sample had a higher rate of acute stress symptoms than the general population [10, 11].

Regarding marital status, a belief suggested that staying married did not protect women but could be an additional source of problems [12, 13]. It was married women who dominated among ECDs with symptoms of acute stress and occupational burnout [10]. The relationship between higher

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job strain and life stress among women may reflect the greater domestic and childrearing tasks taken on by women [14]. On the other hand, the family may provide self-esteem, affective support, and act as a buffer against negative life events. Married people experience less stress than people who have never been married [15, 16].

Women with children employed as ECD may have a particular vulnerability to emergency calls requesting help for children in life-threatening situations, or with serious injuries. The higher number of children in this occupational group was significantly associated with higher symptoms of traumatic stress and a higher level of general stress [17–18]. Because motherhood is a role culturally assigned to women, the need arises to reconcile working hours with the responsibilities of caring for several children of different ages. On-call work may make it difficult for a woman to fulfil her motherly role, becoming an additional source of stress. On the other hand, the number of children at home increases the resources available to the individual by increasing social relationships [17–19].

In many countries, people with higher education dominate the ECD professional group [5]. The role of education in preventing stress at work is explained by the increase of specialist knowledge and the experience gained during education in dealing with stressful situations. On the other hand, it is believed that people with higher education are more prone to stress because they have higher expectations of their jobs [16].

The location of PSAPs may be one factor explaining the perceived stress level in ECDs. Relevant variables differ between individual PSAP centres. The differences concern the number of telephone calls during day and night shifts, the number of incidents handled, the number of notifications handled per resident of the region, the number of allocated and filled positions in each centre, and the number of founded and unfounded calls.

In Poland, the state of the COVID-19 pandemic was announced on 23 March 2020. The first wave was considered the greatest disaster after the World Wars, severely affecting all aspects of life [3]. Occupational demands and perceived stress experienced by ECDs and healthcare workers have increased due to the COVID-19 pandemic, while opportunities for psychophysical recovery for those exhausted by work have decreased [3]. The COVID-19 pandemic led to an increase in ambulance calls [20]. Due to their or their family members' illness and quarantine, the number of staff decreased even further. During the pandemic period, women were more likely to experience its negative impact on family life, and various fears coincided with high levels of perceived stress [21].

Given the social importance of the work of ECDs, it is particularly important to carefully determine the factors affecting its quality and personnel performance. It was assumed that the perceived level of stress is related to married life, having children at home (for a female ECD mother, working during the first phase of the pandemic was additionally stressful), and the localization of the ECD centre. It was additionally assumed that the importance of education on self-image may increase women's stress levels. Organizational changes that followed the increased absenteeism associated with the pandemic resulted in prolonged work hours, which may also have raised perceived stress levels.

The following hypotheses were formulated:

- **Hypotheses 1.** Being married and having children at home were factors that increased the perceived stress level among female ECDs during the first wave of the COVID-19 pandemic.
- **Hypothesis 2.** PSAP location differentiated the relationship between the level of perceived stress and its predictors in a group of female ECDs.
- **Hypotheses 3.** Higher education level and the number of duty hours per month were factors that increased the perceived stress levels of female ECDs during the first wave of the COVID-19 pandemic.

## MATERIALS AND METHOD

Between January – May 2020, a survey conducted in a group of ECD women working in 14 PSAPs in Poland. As of 31 December 2019, 1,101 workers were employed in PSAPs in Poland [22]. A cross-sectional survey was administered to 800 ECDs working in all 17 PSAPs. Completed sets were received from 558 respondents from 14 PSAPs; data from three PSAPs were not returned. The group counted 308 female (56.4%) ECDs. An online platform (<http://sampsze.sourceforge.net/iface/>) was used to check the power of the sample size [23]. The power of the analysis reached 0.95 with a prevalence of 56%, which indicated that the estimated sample size of female ECDs was adequate.

The Polish version of the Perceived Stress Scale (PSS-10) [24] was employed, which is a psychological instrument to measure the degree to which situations in one's life are appraised as unpredictable, uncontrollable, and overloaded over the past month. Two of PSS-questions 10 identify the level of perceived stress as an indicator of the effectiveness of dealing with life events. The questions in the PSS-10 refer to feelings and thoughts which respondents answer on a five-point Likert-type scale: 0 – never, 1 – almost never, 2 – sometimes, 3 – quite often, 4 – very often. The overall raw result ranged between 0 – 40 points. A higher score is an indicator of the greater intensity of perceived stress. In the Polish version, the scale obtained very good psychometric properties with a Cronbach's  $\alpha$  value of 0.86 [28]. In the current study, the Cronbach's  $\alpha$  was 0.883.

**Statistical Analysis.** A multivariate analysis of the effect of multiple variables on the quantitative variable was performed using the linear regression method. The results were presented as parameter values of the regression model with 95% confidence intervals; all p-values below 0.05 were interpreted as indicating significant relationships. In addition, a one-dimensional test of the significance of differences between means with Welch's F-correction and a *post-hoc* analysis with Tukey's RIR and Fischer's NIR tests were performed. The data were analyzed using the statistical computing software environment R (version 4.1.1, R Foundation for Statistical Computing, Vienna, Austria) [25].

The study protocol was approved by the Bioethics Commission at Jagiellonian University Medical College in Kraków, Poland (Decision No. 1072.6120.23.2017, dated 24 October 2019).

## RESULTS

**Descriptive statistics.** The median age of women was 35 years (IQR = 10, range: 19 – 65); median number of children – 0.0 (IQR= 5, range: 0 – 5), mean number of years of service – 4.5 (SD=2.68), and mean number of shifts per month – 14.6 (SD=1,7). 19.83% of the women (n=61) were single, 24.35% (n=75) lived in an open relationship, 41.88% (n=129) lived in their first marriage, and 2.92% (n=9) lived in their second marriage. 10.38% (n=32) women declared living in their third or more marriages, and two women (0.64%) were divorced or widowed. One respondent had vocational education (0.33%), 21.75% (n=67) had secondary education, 77.92% (n=240) had higher education.

The level of perceived stress in the study group was in the medium range (6 sten score) (Tab. 2). The distribution of the results revealed a high level of perceived stress in 38% of the women (7 sten score and above), and in 32.45% a low level (4 sten score and below).

At the beginning of the analysis, a one-tailed test of the significance of differences between the means was performed. After checking the normality of the distributions of the data from each PSAP, it was found that the distributions did not have equal variances. For this reason, Welch's F-test correction for non-equal groups was applied. The result of the analysis of variance with Welch's correction  $F(1.13) = 3.376$  ( $p < 0.000$ ) confirmed the presence of significant differences between average values from differences PSAPs. This means that the values of perceived stress levels in different PSAPs differed significantly (Tab. 1). Differences in the number of respondents from different PSAPs resulted from differences in the number of ECDs employed.

In order to determine precisely which of the means differed and which were equal, a *post-hoc* analysis was conducted and Tukey's RIR test applied. The mean value of perceived stress in PSAP 1 was significantly higher ( $p < 0.05$ ), compared to PSAP 6 (T-Value = 0.02); PSAP 8 (T-Value = 0.01), PSAP 12 (T-Value = 0.02) and PSAP 14 (T-Value = 0.02). The value of perceived stress in PSAP 1 was on the level of seven sten scores (high level), the lowest sten score declared by women with PSAP 8 – four sten score (low level of perceived stress).

**Differences in levels of perceived stress in PSAPs facilities.** As the third step, a multivariate linear regression was performed (Tab. 2).

The results showed that for female respondents for nine of the 14 PSAPs, the level of perceived stress was connected with the location of the PSAP. The afore-mentioned changes involved a decrease in the stress level in relation to that obtained in PSAP 1, assumed as a reference point for further comparisons. The values of score reduction ranged between 3.88 points – 9.69 points. In the other four PSAPs, no changes in stress levels (increase or decrease compared to PSAP 1) were recorded.

Another variable explaining the level of perceived stress, apart from the location of the PSAP, was the number of duty hours per month. In the group of women studied, each additional on-call duty per month raised the level of perceived stress by 0.68 points, on average. Stress levels were also observed in connection with the number of children in care. Each child raised the level of perceived stress by 1.06 points, on average. Taking the level of perceived stress in women with higher education as a reference, having a high

**Table 1.** Descriptive analysis (n= 308)

Variable	N	PSS-10 M (SD)	Seniority M (SD)	Number of shifts M (SD)	Number of children M (SD)	AgeM (SD)	Higher education %	Marital status unmarried %
Total	308	17.01 (6.55)	4.50 (2.68)	14.60 (1.65)	0.64 (0.92)	34.44 (7.84)	77.92	30.8
PSAP 1	30	20.73 (6.24)	4.56 (2.29)	14.10 (1.98)	0.56 (0.72)	35.26 (7.85)	63.33	30.0
PSAP 2	20	17.84 (6.71)	3.01 (2.63)	14.36 (0.49)	0.42 (0.90)	29.35 (5.88)	75.0	35.0
PSAP 3	4	12.75 (6.8)	4.62 (3.19)	14.75 (0.95)	0.75 (0.95)	35.50 (9.46)	75.0	100.0
PSAP 4	20	18.21 (7.17)	3.15 (2.01)	15.47 (2.01)	0.78 (1.22)	33.52 (8.81)	75.0	40.0
PSAP 5	30	19.86 (5.83)	3.97 (2.35)	13.75 (0.51)	0.68 (0.92)	32.96 (6.99)	100	33.33
PSAP 6	15	13.60 (5.69)	4.56 (2.16)	13.53 (1.59)	0.00 (0.61)	34.64 (11.02)	80.0	20.0
PSAP 7	50	16.79 (6.85)	4.68 (1.99)	15.38 (1.25)	0.90 (1.10)	34.36 (6.99)	88.0	22.0
PSAP 8	11	12.54 (6.00)	6.0 (1.94)	14.18 (0.87)	0.63 (0.92)	30.0 (4.84)	81.81	18.18
PSAP 9	9	21.88 (6.15)	5.38 (3.40)	15.00 (3.20)	0.44 (0.72)	30.66 (5.52)	77.77	22.22
PSAP 10	38	15.78 (5.27)	4.74 (3.10)	14.94 (1.91)	0.68 (0.93)	37.54 (8.41)	65.78	39.47
PSAP 11	21	18.14 (7.68)	6.63 (4.08)	14.23 (0.62)	0.42 (0.87)	35.80 (8.21)	61.90	19.04
PSAP 12	31	14.87 (5.05)	4.42 (2.53)	14.74 (1.26)	0.83 (0.93)	37.90 (6.60)	77.41	48.38
PSAP 13	9	16.88 (4.75)	4.86 (2.65)	14.33 (0.50)	0.33 (0.50)	33.88 (8.31)	66.66	.00
PSAP14	20	14.00 (6.12)	3.28 (2.08)	14.36 (2.65)	0.36 (0.76)	31.21 (6.98)	90.0	30.0

PSAP – public-safety answering point; N – number; M – mean; SD – standard deviation.

school education lowered the level of perceived stress by 1.78 points. As for the age and marital status of the female respondents, the mentioned variables were associated with a decrease in the stress level. As far as the respondents' age was concerned, each year lowered the level of perceived stress by 0.12 points. In the case of marital status, taking the level of perceived stress in unmarried women as a benchmark, a 2.11-point decrease in stress was observed for women living in their first marriage. The decrease in the number of women living in a second marriage was higher, reaching 4.20 points.

The results presented above were confirmed with the application of *post hoc* tests. Fisher's NIR test showed a statistically significant difference in the level of perceived stress among those with a high school education ( $F = 18.39$ ), who had lower scores than those with Bachelor's and Master's degrees ( $F = 16.59$ ) ( $p < 0.05$ ). The respondents who were married for the first time ( $F = 16.45$ ) and for the second time ( $F = 13.00$ ) had lower scores in the level of perceived stress than singles ( $F = 17.98$ ) and lived an open relationship ( $F = 17.64$ ) (all  $p < 0.05$ ). The respondents aged 40 – 45 years had lower scores in the level of perceived stress ( $F = 14.12$ ) than those aged 25–31 years ( $F = 17.53$ ), aged 31–35 years ( $F$



**Table 2.** Results of multivariate linear regression of the level of perceived stress.

Variable	Parameter	95%CI	p	
1	ref.			
2	-3.876	-7.42 -0.332	0.033 *	
3	-9.695	-16.206 -3.185	0.004 *	
4	-4.312	-7.964 -0.66	0.021 *	
5	-.286	-3.47 2.897	0.86	
6	-6.296	-10.078 -2.513	0.001 *	
7	-4.635	-7.433 -1.838	0.001 *	
8	-7.563	-11.75 -3.376	<0.001 *	
9	0.538	-4.005 5.082	0.817	
10	-5.598	-8.535 -2.662	<0.001 *	
11	-2.659	-6.085 0.767	0.129	
12	-6.214	-9.319 -3.109	<0.001 *	
13	-3.855	-8.442 0.732	0.101	
14	-6.878	-10.406 -3.351	<0.001 *	
Length of service in the profession	0.106	-0.195 0.408	0.49	
Number of duty hours per month	0.682	0.24 1.123	0.003 *	
Number of children	1.058	0.141 1.975	0.024 *	
Age	-0.124	-0.242 -0.006	0.04 *	
Education	Bachelor's and Master's degree	ref.		
	secondary	-1.781	0.038 3.524	0.046 *
	vocational	9.398	-2.783 21.58	0.132
Marital status	single	ref.		
	on open relationship	-0.448	-2.563 1.668	0.679
	married for the first time	-2.113	-4.233 0.006	0.05 *
	married for the second time	-4.204	-8.899 0.491	0.05 *
	married for the third time	0.154	-2.777 3.085	0.918
	divorced and widowed	-2.118	-10.826 6.591	0.634

PSAP – public-safety answering point; ref. – reference point; p – multivariate linear regression. \* statistically significant relationship (p<0.05)

=18.17), and aged 35–40 years ( $F=17.70$ ;  $p<0.001$ ). The survey participants with one child had lower scores in the level of perceived stress ( $F=15.27$ ) than those without children ( $F=17.24$ ), two children ( $F=17.70$ ) and three or more children ( $F=18.91$ ;  $p<0.05$ ).

**Differences in levels of perceived stress across the three PSAPs.** In order to gain a better understanding of the relationships in question, the associations of explanatory variables with the level of perceived stress were analyzed for female respondents from three of the 14 PSAPs. In these three PSAPs,  $p$  obtained a significant value (Tab. 3 – 4).

For female respondents working in PSAP No. 7 (Tab. 3), each additional year of work increased perceived stress by 0.99 points, on average. Similarly, each child was associated with an increase in the level of perceived stress by 3.41 points, on average. Being in the first marital relationship was associated with a decrease in respondents' perceived stress by 10.23 points, on average, compared to women living independently. For women living in their second marriage, this decrease in perceived stress was greater and reached 19.61 points, compared to single women. For women living in their third marriage, the decrease in perceived stress reached 2.66 points, compared to single women.

**Table 3.** Results of multivariate linear regression of the level of perceived stress in PSAP 7.

Variable	Parameter	95%CI	p	
Length of service in the profession	0.995	0.074 1.916	0.04*	
Number of duty hours per month	1.119	-0.12 2.358	0.084	
Number of children	3.413	1.591 5.235	0.001*	
Age	-0.251	-0.528 0.027	0.084	
Education	Bachelor's and Master's degree	ref.		
	secondary	1.956	-3.04 6.953	0.447
	single	ref.		
Marital status	on open relationship	-5.658	-11.781 .465	0.077
	married for the first time	-10.23	-16.197 -4.263	0.002*
	married for the second time	-19.61	-31.884 -7.337	0.003*
	married for the third time	-2.664	-9.837 4.509	0.47

ref. – reference point; p – multivariate linear regression. \* statistically significant relationship (p<0.05).

**Table 4.** Results of multivariate linear regression of the level of perceived stress in PSAP No. 8

Education	Bachelor's and Master's degree	ref.			
	secondary	-3.816	-7.317	-0.315	0.166

ref. – reference point; p – multivariate linear regression. \* statistically significant relationship (p<0.05)

In respondents working in PSAP 8 (Tab. 4), no relationship was observed between the level of perceived stress and the length of work in this profession. On the other hand, some correlations were observed regarding their marital status. Being in an open relationship co-occurred with a decrease in stress level by 19.17 points, compared to single respondents. Similar correlations were found for respondents living in their first relationship – 18,08 points, and third relationship – 17.14 points, compared to women who were single.

In the case of respondents in PSAP 11, the opposite relationship to that obtained earlier was observed. Being married for the first time raised the level of perceived stress by 9.74 points, compared to the respondents who were single ( $p<0.04$ ).

## DISCUSSION

The level of perceived stress in the surveyed group of women was in the medium range (six sten scores). However, women dispatchers with elevated psychological distress scored one standard deviation higher than the general population [24]. One-third of the female respondents declared a strong tendency to perceive their life situation as unpredictable and out of control. A small group (9.4%) of the sample reported extreme stress levels (nine – ten sten score, which was nearly two standard deviations higher than the general population.

In Turkey, the perceived stress level was two points higher than in a group of female ECDs [18], and in the USA two points lower than in a group of police emergency dispatchers (88% women) before the COVID-19 pandemic [26]. This was higher than in telephone emergency service consultants in Austria during the COVID-19 pandemic [27]. A survey of medical hospital workers in Poland conducted during the first wave of the pandemic produced similar results [28]. Slightly lower results were obtained in another survey conducted in a group of operators of three PSAP centres in Poland.

However, the measurement was conducted during the second wave of the pandemic, and, as stated by the authors, some respondents may have already adapted to the additional demands of the job [29].

It is known from many studies that negative emotions accompanying high levels of stress reduce employees' level of commitment to work [30]. Strain and negative emotions prompt a person to avoid situations that trigger or intensify them. Employees may avoid sources of additional stress and work under pressure with less commitment. It has also been noted that employees under stress are prone to create additional demands in the workplace in addition to those already in existence, an example of which is absence through illness, which generates the need to take over the work of an absent colleague. As a result, there is a growing spiral of negative feelings and behaviours in the workplace, provoking conflicts and increasing the risk of mistakes.

Contrary to the first hypothesis, being married was associated with lower levels of perceived stress. The benefits of being married are clearly indicated by the results obtained by women working at PSAP 7. Importantly, the women employed there were characterized by the highest number of children, and their work organization required from them the highest number of on-call duties per month. The results were similar to those obtained in a study of medical workers, in which the highest levels of perceived stress were reported by unmarried people, compared to those living in a marriage [31]. Also, in another ECD study, results indicating a buffering effect of marriage on stress were obtained, although the effect obtained was not statistically significant [4].

The first hypothesis also assumed that in the case of mothers working in PSAPs, having children could be a factor in increasing perceived stress levels during the first wave of the COVID-19 pandemic. Even though having children is seen as an indicator of general familial and social support, in the case of ECD, it may expose the employee to excessive identification with callers. Analyses of the system operation in Poland lack in-depth information on the categories of reported problems. Numerous studies have noted a marked increase in stress levels and mental health deterioration in parents caused by the COVID-19 pandemic [5]. Studies of working mothers revealed that they are at a higher risk of mental health deterioration compared to men, which was explained by the need to combine maternal and professional roles. It is believed that the COVID-19 pandemic may have exacerbated existing parental role imbalances related to parental gender. Women working in health care who declared they had problems caring for their children during the pandemic had higher levels of perceived stress, compared to those who did not have such a problem [3]. The current study showed that having an additional child raised the perceived stress level among the in the women studied.

On the other hand, despite the large number of employees and the relatively small number of emergency calls, according to the women's declarations, perceived stress increased with the number of children at home. The age of the child was also an important variable. Working women with children under the age of five years reported greater difficulty with balancing work and family life, and higher levels of perceived stress [32].

The study assumed that the location of a PSAP is a factor explaining differences in the perceived stress levels of employed women. The hypothesis was confirmed. It must be noted that the number of filled operator positions in

the surveyed PSAPs in 2019, and the number of incoming calls and incidents handled, did not play a statistically significant role as an explanatory variable for differences in the level of perceived stress in the surveyed facilities. Therefore, an examination should be undertaken of the characteristics of the results from the four PSAPs whose results were presented earlier. For each of them, a different distinguishing characteristic emerged. The work of PSAP 11 provided a service to the provincial capital region. In 2019, the number of positions occupied at the centre was within the average range. The region topped the other centres in terms of the number of legitimate calls *per capita*. It also topped the other four centres in the country regarding the number of incidents, which was four times higher.

PSAP 1 ranked second in the country for the number of incidents handled, while PSAP 7 was the facility with the highest number of occupied operator positions in 2019, but ranked fourth in the number of incoming calls. The distinguishing feature of this centre was the highest number of unfounded calls. The responders at PSAP 8 declared the lowest perceived stress level and was the centre with the lowest number of allocated and filled positions. Regarding the number of incoming calls, PSAP 8 was in penultimate place; the number of incidents was also near the bottom of the pile.

In conclusion, in 2019, the two centres handled the most emergency incidents while one handled the least; one PSAP had the highest number of unfounded calls.

In Poland in 2019, each PSAP suffered from staff shortages, although none of them were large. What is certain is that work requirements differ among PSAP centres, which leads to two conclusions. The first confirms the need for individualization in the approach to the problem. The second indicates that changes in perceived stress may result from many factors, including organizational resources at a particular workplace. Actions should be taken to increase organizational and unit resources in PSAP facilities, and reduce levels of perceived stress [4].

The third hypothesis assumed that having a higher education may create a psychological situation conducive to occupational stress. The study confirmed this hypothesis. The results were most evident in PSAP 5, where all female employees had a university degree, and the declared level of perceived stress was high. In 2019, PSAP 5 ranked in the middle of the ENS system in Poland regarding the number of filled operator positions the number of incoming calls, and the number of incidents handled. In the previously cited study of personnel working at emergency service centres in Turkey, the level of perceived stress did not differ depending on the subjects' education level [22]. In the current study, the group of women with extremely high levels of stress was dominated by women with higher education (69%). This is consistent with the assumption that people with a higher education expect more from their work, and are exposed to higher levels of perceived stress.

The third hypothesis also assumed that increased on-call duties per month are a factor that increases perceived stress levels. It is believed that the number of on-call duties followed by more hours spent at work is a source of work overload and raises stress levels. In the current survey, the stress level declared by women working above the recommended limit of 48 hours per week was extremely high. In a study of a group of nurses, a co-occurrence of high levels of perceived stress coincided with an increase in weekly hours above 40 [20].

**Limitations of the study.** The limitations of the methodology employed can be divided into several groups that need to be discussed in detail in order to fully understand the possible influences on the interpretation of the result, as well as their applicability to other populations. The lack of previous research on this professional group, especially in the pre-pandemic period, made it impossible to compare the obtained results.

1. **Sample selection.** Although the intention was to cover the entire Polish ECDs population, results were not obtained from three PSAPs. The groups of respondents often differed significantly in size and the low size of some of them may have been the reason for the lack of significant correlations in these groups. This is probably why the most correlations were discovered in PSAP 7, the most numerous group of respondents. Although the survey included a significant number of participants (558), the group was restricted to women ECDs working in 14 of the 17 PSAPs in Poland. This means that the results did not include data from the three centres from which results were not obtained, which may have affected the representativeness of the sample in relation to the entire ECD population in Poland. In addition, although the platform used to calculate the sample size provided adequate statistical power (0.95) for the estimated sample size of women, the selection of participants may have been partly limited by the availability or willingness to complete the questionnaire.
2. **Nature of the cross-sectional survey.** Random selection was not used in the hope of receiving responses from all employees from all Polish PSAPs. This could have led to an underestimation of the survey's effects, as those omitted may have been absent due to illness, or may need more energy to participate. The survey was cross-sectional, which meant that data were collected at a single point in time. Such a design makes it impossible to assess causal relationships between the variables studied. The results only reflect the state at a specific point in time, without providing information about the dynamics of change over time, e.g. the effect of long-term stress on the ability to cope with difficult situations.
3. **Research tool.** Although the Perceived Stress Scale (PSS-10) is a well-validated tool with high psychometric reliability (Cronbach's  $\alpha$  0.86 in the Polish version and 0.883 in the current study), it is limited to assessing participants' subjective feelings and thoughts. Such an approach may omit more objective indicators of stress, such as physiological data (e.g. cortisol levels), which could provide a broader picture of the participants' situation. In addition, responses to scale questions may be susceptible to distortion due to subjective interpretations of the questions, mood at the time of completing the survey, or the desire to portray oneself in a certain light (social approval effect). Moreover, self-report questionnaires run the risk of measurement errors, such as reporting errors, method variance errors, errors in obtaining data from only one source, and reverse causality errors.
4. **Demographic and occupational diversity.** The survey focused only on female ECDs, which limited the generalizability of the results to the entire population of PSAP employees, including men. In addition, despite identifying the number of PSAP employees, there is no detailed information on the demographic and occupational characteristics of the respondents (e.g. age, length of

service, level of education), which may have important implications for stress levels and coping skills.

In conclusion, although the study provided valuable information on the level of perceived stress among ECD women in PSAPs in Poland, the mentioned limitations should be taken into account when interpreting the results and planning further studies that could fill the existing gaps, e.g. by using longitudinal designs or considering a wider range of variables.

The mental health of frontline workers, especially women working in emergency services, was significantly compromised during the first waves of the COVID-19 pandemic due to unprecedented levels of stress. This stress may have triggered a range of adverse emotional reactions, including:

1. *Emotional tension and anxiety.* Associated with a heavy workload: the overwhelming number of emergency calls and the constant pressure to respond quickly and effectively increased emotional tension and anxiety [33, 34] when callers were also frightened by their symptoms or those of their loved ones [35];
2. *Insomnia.* The stress and anxiety associated with their roles often resulted in sleep disturbance and insomnia, further affecting their mental health and reduced life satisfaction [36];
3. *Occupational burnout.* Occurs due to prolonged stress and continuous exposure to highly stressful situations without adequate rest and recuperation, which could lead to occupational burnout which, as in other stress-related occupations during the COVID-19 pandemic, was characterised by emotional exhaustion, depersonalisation and reduced personal fulfilment [36].
4. *Impaired judgement.* High levels of professional stress and burnout can impair judgement and decision-making, potentially affecting their performance and quality of the work provided [37].

As the sequelae of stress experienced by respondents are long-lasting, like people in other stressful professions, they require comprehensive mental health support, including counselling services, stress management programmes and organisational changes to reduce workload and provide adequate resources [38, 39].

**Significance for Healthcare Policy and Practice.** By examining stress during the early waves of the pandemic, the study provides insights into how the unprecedented global health crises affected frontline workers. This is crucial for preparing for future pandemics or similar emergencies.

1. **Mental Health Awareness.** The findings of the study underscore the importance of mental health support for emergency operators who are often exposed to high-stress situations. This can lead to better mental health policies and practices within healthcare systems.
2. **Enhanced Support Systems.** The study suggests the need for robust mental health support systems for female emergency operators. This could include counseling services, stress management programmes, and peer support groups.
3. **Policy Development.** The findings can improve the development of policies aimed at reducing workplace stress, and improving working conditions for emergency operators. This might involve changes in shift patterns, workload management, and access to mental health resources.



**4. Training and Education.** Healthcare facilities could use the insights from this study to develop training programmes that equip emergency operators with skills to manage stress effectively. This could include resilience training and techniques for coping with high-pressure situations.

## CONCLUSIONS

The study confirmed that during the period of heightened anxiety caused by the first waves of the COVID-19 pandemic, many female ECDs experienced elevated levels of perceived helplessness, their lives seemed to be unpredictable, uncontrollable and overloaded. They also faced additional life stress because of gender roles. From a practical point of view, the study results indicate the need to individualize measures to strengthen employees' organizational and individual resources. The study also showed that groups of female ECDs require special attention from their employers. In the analysis of the effects of the pandemic, the gender dimension should be taken into account in assessing public health.

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