

Stress in parents of very low birth weight preterm infants hospitalized in neonatal intensive care units. A multicenter study

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ABSTRACT

Introduction. The birth of a premature baby is a stressful event for parents. The objective of this study was to determine early stress in parents of very low birth weight infants (VLBWIs) hospitalized in 12 neonatal intensive care units from a South American Neonatal Network, to identify associated factors, and to compare the level of parental stress in public versus private healthcare facilities.

Population and Methods. Cross-sectional study in mothers/fathers of VLBWIs (500 to 1500 g). Early parental stress was measured using the Parental Stressor Scale, with a score from 1 (low stress) to 5 (high stress). The sociodemographic characteristics of parents and newborn infants were collected and associated with levels of parental stress.

Results. The study included 273 fathers/mothers of a total of 218 VLBW preterm infants. The survey was administered at 5.9 ± 2.0 days of life. The average total parental stress was 3.1 ± 0.8 , and the highest score was obtained for the parental role subscale (3.6). A lower education level, unemployment, not having held the newborn infant, and respiratory support requirement were associated with higher parental stress levels. Stress was higher among mothers than fathers, and at public facilities versus private ones.

Conclusions. Among parents of VLBWIs, a moderate early parental stress was observed. Parental role alteration was the most relevant factor. Parental stress was higher among mothers and at public healthcare facilities. A greater sensitization, further research and interventions in this area are required.

Key words: psychological stress, parents, very low birth weight infant, neonatal intensive care units.

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of a VLBWI was 59 days.¹ Parents of VLBWIs suffer high levels of stress and face the challenge of adapting positively to this experience.²⁻⁴

Several studies have reported that a high parental stress level following the birth of a preterm infant may impair the mother-child bond⁵ and the possibility of establishing a secure attachment.⁶⁻⁸ Parental stress and maternal depression symptoms have shown to be risk factors for future social, behavioral and functional development of preterm infants.⁹⁻¹¹

Identifying the main risk factors associated with parental stress may be helpful to provide early focused interventions that allow to visualize the problem and raise awareness among health care staff members who look after these highly vulnerable infants and their families. As per our knowledge, there are no other multicenter studies conducted in South America including such a large number of participants and that describe a regional reality.

The main objective of this study was to determine early stress in parents of VLBWIs hospitalized in the NICUs participating in the Neocosur South American Neonatal Network, to identify associated factors, and to compare the level of parental stress between public and private sites.

POPULATION AND METHODS

Multicenter, international, observational and cross-sectional study conducted at the neonatology units participating in the Neocosur

INTRODUCTION

Very low birth weight infants (VLBWIs) experience lengthy hospitalizations in neonatal intensive care units (NICUs). A prior study conducted by the Neocosur Network found that the average length of stay

Network.¹² This is a voluntary, non-profit association. At present, it is made up of 24 NICUs from six South American countries (Argentina, Brazil, Chile, Paraguay, Peru, Uruguay).

At the time of the initiation of the study, there were 18 participating sites that were openly invited to voluntarily participate in this study.

Inclusion criteria were being the mother or father of a VLBWI hospitalized at the NICU, whose newborn infant (NBI) was 3-10 days old. In addition, parents were required to have been with their NBI at the NICU at least once, and to sign the informed consent.

Exclusion criteria were that the NBI was diagnosed with a genetic disorder and/or major congenital malformations or an extremely severe condition, as per the treating physician's criterion; that parents had had a previous preterm infant hospitalized; and/or that they had triplets or more children.

Stress scale

Parental Stressor Scale: Neonatal Intensive Care Unit (PSS-NICU): This survey was designed by Miles¹³ to measure parental self-perception of stress associated with having a preterm infant hospitalized at the intensive care unit (ICU). The survey is self-administered and includes 34 items grouped into three subscales that reflect parental perceptions regarding the NICU environment (what specific factor or situation is cognitively perceived, interpreted and represented as the most stressful for parents): a) Sights and sounds in the NICU environment; b) Infant behavior and appearance (disease status and care required by the NBI); c) Parental role alteration (interaction with their baby).

Surveyed parents had to score each item from 1 to 5, using 1 when the item was not at all stressful; 2, if it was slightly stressful; 3, if it was moderately stressful; 4, if it was very stressful; and 5, if it was extremely stressful. If the item described was not applicable, the score was 0. Total parental stress (TPS) was estimated based on the average of the three subscales. The Spanish-language validated version of the scale was used.¹⁴

The PSS: NICU has demonstrated to have an excellent validity and reliability in studies conducted in different countries.¹⁵⁻¹⁷

Demographic and perinatal background

The following data were collected:

History of pregnancy and childbirth: type of

delivery, gravidity, hospitalization during pregnancy, antenatal care. *Social background:* age, marital status, education level, employment status. Education level was categorized as <8 or ≥8 years, since in this region this is equivalent to complete basic education. *NBI history:* gestational age, birth weight, Apgar at 1 and 5 minutes, sex, respiratory support, and days of life at the time of assessment. *Any other significant history:* having held the NBI, history of abortion/stillbirth. In addition, sites were categorized into public/private.

Phase I of the study included training and a pilot test conducted at each unit by administering the survey to three fathers and/or mothers to screen potential problems related to the implementation and/or understanding of the scale.

The survey was administered in a private room (outside the ICU) by a member of the health care team (physician, nurse, or psychologist) who was not part of the team treating the preterm infant at that time. In turn, sociodemographic data and pregnancy/birth history were also collected. The administration of surveys lasted approximately 30 minutes. Data were submitted by each site in electronic format and were then recorded in a centralized sheet for analysis. Data were collected between January 2010 and September 2011.

Ethical considerations

The study was approved by the local ethics committee of each participating site.

Statistical analysis

The necessary sample size was estimated at 160 subjects (80 in each group) in order to estimate a difference between two averages of 15% (0.45 points of difference) in the stressor scale and assuming a SD ± 1 in each group's scale. This was a multicenter study focused on a higher representativity, so a larger sample size was estimated, not less than 250, which was enough to detect the above mentioned differences and estimate overall average stress.

The population of parents and NBIs was described as per their main characteristics. Continuous outcome measures were reported as mean and standard deviation, while categorical outcome measures were described as frequency and percentage.

In order to compare the average level of stress as per categorical demographic variables

related to NBIs, a Student's *t* test or an ANOVA was used for independent samples, based on the number of categorical variable levels. In this case, Bonferroni's or Scheffé's correction was used for multiple comparisons. Pearson's correlation was used to compare continuous outcome measures with the stress level.

Odds ratios (OR) with a 95% confidence interval (95% CI) were obtained by means of a simple logistic regression analysis to establish an increase in risk. Stress level was categorized as low (≤ 3) and high (> 3), in accordance with the levels used in a prior study.¹⁸

P values below 0.05 were considered significant. Statistical analyses were performed using the SPSS 16.0 software.

RESULTS

Twelve neonatology units member of the Neocosur Network from four countries (Argentina, Chile, Paraguay, Peru) participated in the study. A total of 273 parents who had preterm infants with a birth weight of 500 to 1500 g hospitalized at the NICU at 5.9 ± 2.0 days of life (mean \pm SD) were interviewed.

Among interviewed mothers, 74% had had a C-section and 61% had been hospitalized during this pregnancy. At the time of assessment, 40% of parents had held their baby at least once.

In terms of NBI birth weight ($n = 218$), 33% had a birth weight lower than 1000 g. In relation to preterm infants requiring respiratory support at the time of assessment, 56% were on some kind of ventilation. Of these, 26% were on

mechanical ventilation, 23% were on continuous positive airway pressure (CPAP), and 7% had a nasal cannula.

Overall characteristics of interviewed parents and their NBIs are described in *Table 1*. TPS and subscale scores are shown in *Table 2*.

Parental role alteration had the highest score among the subscales. In this category, the highest-scoring items were being separated from the baby (4.2 ± 1.1), followed by not being able to feed the baby (3.8 ± 1.4) and not being able to protect the baby from pain and painful procedures (3.8 ± 1.5). In the behavior and appearance subscale, the most stressful factor for parents was seeing tubes and equipment on or near the baby (3.3 ± 1.4), followed by seeing needles and tubes on the baby (3.3 ± 1.5), and a weak appearance of the baby (3.1 ± 1.5). Finally, in the sights and sounds subscale, the most stressful item for parents were the sudden noise of alarms (3.4 ± 1.4), followed by the continuous noise of monitors and equipment (2.7 ± 1.4), and the presence of monitors and equipment at the NICU (2.6 ± 1.3).

TPS was higher among mothers than fathers ($p = 0.011$); in turn, mothers showed a risk three times higher of being highly stressed in the setting of a NICU than fathers (OR = 3.35, 95% CI: 1.50-7.47). Unemployed parents or housewives were associated with a higher stress level ($p = 0.024$). In terms of education level, parents with an education of less than 8 years also showed higher stress levels ($p = 0.034$). No significant associations were observed between TPS and parity, history of abortions, and hospitalization during pregnancy.

FIGURE 1. Total parental stress (mean, standard deviation) by public/private facility

Parents		(n= 273)
Sex	Female (%)	72.5
Age	Years (mean, SD)	29.0 (8.1)
	Younger than 19 years old (%)	9.2
Marital status	Single (%)	32
Employment status	Unemployed (%)	43
Education level	≤ 8 years (%)	36
Newborn infant		(n= 218)
Birth weight (g) (mean, SD)	1135 (268)	
Gestational age (weeks) (mean, SD)	29 (2.6)	
Female sex (%)	48.6	
Apgar at 5 min (mean, SD)	8 (1.6)	
Respiratory support (%)	56	

SD: standard deviation.

However, a higher TPS was observed in women with no antenatal care ($p=0.041$). Finally, parents who had not held their baby had a higher level of stress ($p<0.001$) and twice the risk of being highly stressed (OR= 2.13, 95% CI: 1.22-3.74).

In relation to NBI variables, requiring respiratory support was associated with a higher TPS ($p=0.02$), both when the NBI was on mechanical ventilation ($p=0.017$) and on CPAP ($p<0.0001$).

Regarding the type of site, parents at public sites ($n=165$) showed higher stress levels ($p<0.001$) than those at private sites ($n=53$) (Figure 1).

DISCUSSION

Our study found a moderate early TPS (3.1) in parents of VLBWIs hospitalized at the NICUs included in this investigation. This is similar to what has been reported in recent studies on this subject.¹⁸⁻²⁰ The subscale with the highest average score for stress was parental role alteration, followed by infant behavior and appearance, and sights and sounds at the NICU. These findings are consistent with other studies that have used the PSS: NICU¹⁹⁻²² and show that an important source of stress in the families is not being able to meet their babies' basic needs, not

TABLE 2. Parental stress and total parental stress subscales in relation to the characteristics of parents and very low birth weight infants

		Parental role Mean (SD)	Behavior and appearance Mean (SD)	Sights and sounds Mean (SD)	Total parental stress Mean (SD)
Total		3.6 (1.0)	3.1 (0.9)	2.6 (0.9)	3.1 (0.8)
NBI					
Sex	Male	3.64	3.17	2.61	3.14
	Female	3.64	3.26	2.63	3.17
	<i>P value</i>	0.944	0.484	0.913	0.764
Birth weight (g)	≤ 1000	3.69	3.31	2.60	3.20
	> 1000	3.61	3.15	2.62	3.13
	<i>P value</i>	0.526	0.228	0.892	0.490
Apgar at 1 min	≤ 3	3.82	3.43	2.92	3.39
	> 3	3.60	3.16	2.56	3.11
	<i>P value</i>	0.150	0.141	0.047	0.055
Respiratory support	Yes	3.75	3.29	2.75	3.26
	No	3.50	3.11	2.45	3.02
	<i>P value</i>	0.050	0.172	0.016	0.020
Type of delivery	C-section	3.64	3.17	2.55	3.12
	Vaginal	3.65	3.33	2.81	3.27
	<i>P value</i>	0.906	0.258	0.071	0.212
Mothers/fathers					
Type	Father	3.10	2.89	2.49	2.82
	Mother	3.73	3.26	2.64	3.21
	<i>P value</i>	0.001	0.043	0.416	0.011
Age (years)	< 18	3.56	3.30	2.87	3.24
	≥ 18	3.65	3.20	2.59	3.15
	<i>P value</i>	0.664	0.570	0.176	0.511
Education level (years)	≤ 8	3.74	3.41	2.72	3.29
	> 8	3.57	3.08	2.55	3.06
	<i>P value</i>	0.185	0.010	0.192	0.034
Employment status	Unemployed	3.72	3.32	2.76	3.27
	Employed	3.54	3.08	2.46	3.03
	<i>P value</i>	0.186	0.061	0.020	0.024
Having held the baby	Yes	3.38	2.99	2.35	2.91
	No	3.81	3.35	2.79	3.32
	<i>P value</i>	0.001	0.004	0.001	<0.001
Marital status	Married/living with their partner	3.75	3.34	2.66	3.25
	Single	3.56	3.15	2.59	3.10
	<i>P value</i>	0.156	0.168	0.606	0.177

NBI: newborn infant; SD: standard deviation.

being able to protect them and being apart from them.²³

Findings in a recent study conducted in India²² are similar to ours. The subscale with the highest score is parental role alteration (4.1), followed by behavior and appearance (4.1) and sights and sounds (2.5). In addition, an Italian multicenter study¹⁸ conducted before hospital discharge also found that parental role alteration scored highest for stress (3.4). Authors concluded that the experience at the NICU is highly stressful for mothers, especially in relation to the marginalization from their parental role.

Mothers showed a higher stress level than fathers, which is consistent with most existing studies.^{21,24} Parental characteristics associated with a higher parental stress in our study were having a lower education level, being unemployed and not having been able to hold their baby.

Our results are consistent with a study that found that maternal adaptation to stressors caused by neonatal hospitalization is strongly associated with socioeconomic and education levels, and employment status.²⁵ This may be explained by the reduced availability of resources to adapt to the situation and the difficulty to understand information provided to them.

Another study among mothers of preterm infants associated a lower education level with the perception of receiving less support from nurses, and feeling more stress and maternal

depression.²⁶ Other studies have also reported that younger mothers suffer more stress.¹⁹

In this study, parents who had held their babies at least once showed a lower level of early stress. This is a very relevant finding and reinforces the importance for parents of an early physical contact with their baby, both to reduce stress and to promote positive early interactions that will favor a secure attachment.^{27,28} This is also consistent with studies that suggest that physical contact and emotional closeness between mother and child are critical for the physical and emotional well-being of both.²⁹

In addition, our results show that the most stressful factor for parents in relation to their baby's condition is the requirement of respiratory support. Other studies have identified that, in addition to respiratory support, a lower birth weight and a younger gestational age are parental stressors,³⁰ as well as the perception of how sick their child is.³¹

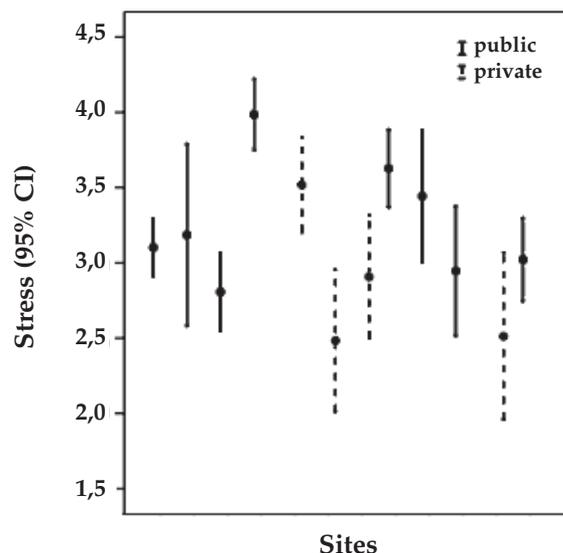
Parental stress was higher among parents who attend public healthcare facilities versus private ones. This may be explained by the differences in facilities, resources and also by the fact that the population is more vulnerable. A low socioeconomic level has been identified as a risk in the process of adaptation to the birth of a preterm infant, since it may limit family access to financial, social and cultural resources.²⁵

This study has certain limitations. It only includes the review of the initial period of hospitalization of VLBWIs and excludes NBIs with extremely severe conditions. According to other studies, parental stress may continue and extend for several months in parents of extremely preterm infants.^{9,10} In addition, no information was collected regarding other factors related to parental stress, such as breastfeeding, anxiety and depression.^{18,32}

The main strength of this study is that it includes a large number of sites and provides new information for the South American region.

This study also aims at developing a greater sensitization in this area and focusing more on the psychosocial aspects of parents of preterm infants hospitalized at the NICU. In addition, it reinforces the importance of family-oriented maternity centers³³ and of a greater involvement of professionals in the field of psychology as part of health care teams. It seems relevant that NICU staff identifies parental stressors so that they can develop intervention policies that allow to better manage parental anxieties, reduce stress, favor attachment behaviors, and encourage their ability

FIGURE 1. Total parental stress (mean, standard deviation) in relation to public/private sites



to understand and adapt to the complex settings of a NICU.

CONCLUSIONS

Having a VLBWI hospitalized at the ICU is a stressing experience for parents. Parental role alteration is the most important stressor. Several factors were identified as associated with parental stress, notably the fact of not having held the baby. Parental stress was higher among mothers than fathers, and at public healthcare facilities versus private ones. It is important to conduct new studies in this region with interventions that help reduce parental stress and aim at improving the emotional wellbeing of parents. ■

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