Parental wellbeing after diagnosing a child with biliary atresia

Rodijk, Lyan H; de Kleine, Ruben H; Verkade, Henkjan J; Alizadeh, Behrooz Z; Witvliet, Marieke J; Hulscher, Jan B F; Bruggink, Janneke L M

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2022

[Link to publication in University of Groningen/UMCG research database](#)

Parental wellbeing after diagnosing a child with biliary atresia: A prospective cohort study

Lyan H. Rodijk[a], Ruben H. de Kleine[b], Henkjan J. Verkade[c], Behrooz Z. Alizadeh[d], Marieke J. Witvliet[e], Jan B.F. Hulscher[a], Janneke L.M. Bruggink[a,*]

[a] Section of Pediatric Surgery, Department of Surgery, University Medical Center Groningen, the Netherlands
[b] Section of Hepato-pancreatico-biliary Surgery and Liver Transplantation, Department of Surgery, University Medical Center Groningen, the Netherlands
[c] Section of Pediatric Gastroenterology and Hepatology, Department of Pediatrics, Beatrix Children's Hospital, University Medical Center Groningen, the Netherlands
[d] Department of Epidemiology, University Medical Center Groningen, the Netherlands
[e] Section of Pediatric Surgery, Department of Surgery, Wilhelmina Children's Hospital, University Medical Center Utrecht, the Netherlands

ARTICLE INFO

ABSTRACT

Purpose: To determine anxiety, stress, and quality of life (QoL) in parents of children who are diagnosed with biliary atresia (BA).
Methods: Parents of BA patients (0–3 years) completed validated questionnaires at three time points: at first hospitalization (T0); 1–2 months post diagnosis (T1); and 2–3 years post diagnosis (T2). Results are presented in medians (min-max).
Results: We included 52 parents (age 31 [24–51 y], 31 females) of 30 BA patients. In fathers, neither anxiety nor stress levels significantly differed from reference values. Mothers reported significantly higher anxiety levels compared to reference values (T0: 48 *vs* 35, $p = 0.001$; T1: 43 *vs* 35, $p = 0.03$; T2: 37 *vs* 35, $p = 0.04$), which significantly decreased over time (-23% between T0 and T2: $p = 0.04$). Stress in mothers was significantly higher at T1 than at T2 (+35%, $p = 0.02$), but was not significantly different from reference values at each time point (T0: 17 *vs* 14, $p = 0.07$; T1: 18 *vs* 14, $p = 0.09$; T2: 13 *vs* 14, $p = 0.52$).The overall QoL in mothers and fathers was rather unaffected.
Conclusions: Particularly mothers of infants diagnosed with BA report high anxiety levels up to three years after diagnosis. The overall QoL of parents is rather unaffected after diagnosing BA in their child.
Level of Evidence: Level 2.

1. Introduction

A child diagnosed with a severe disease can profoundly impact parental wellbeing and quality of life (QoL). [1–3] Parents experience uncertainties regarding disease progression and frequently worry about the wellbeing of their child. [4]

Biliary atresia (BA) is a progressive liver disease that affects neonates within the first weeks after birth. Untreated, BA is a fatal disease. [5] For optimal outcomes, it is essential that patients receive timely adequate treatment. [6,7] The prognosis of BA patients has been much improved by the development of the surgical Kasai portoenterostomy (KPE), aiming to restore bile flow between liver and intestine. [8] However, ongoing liver disease occurs in the majority of patients, resulting eventually in end-stage liver disease, which requires liver transplantation (LTx). [6]

It is conceivable that having an infant with BA severely affects parental wellbeing. [9] Previously, we observed that parents of BA patients at school age report comparable levels of anxiety, stress and QoL as the general population. [10] However, data on psychosocial outcomes, including symptoms of anxiety and stress, and its effect on QoL in parents early after BA diagnosis is lacking. It is at these times that it would be very helpful to sufficiently support and, if needed, provide psychological treatment for the parents. Parental support might not only improve parental wellbeing, but also that of their infants, as it may influence the ability of parents to provide adequate care, comfort the child and promote the child's development. [11].

We aimed to determine the levels of anxiety and stress, as well as the QoL, in parents of BA patients in the first three years after diagnosis. We also aimed to identify factors that are associated with these psychosocial outcomes in parents.

---

2. Methods

2.1. Participants

Between September 2016 and September 2019, we prospectively included parents or caregivers of BA patients (0–3 years) in a nationwide cohort study. Throughout this manuscript we will refer to caregivers as parents. Inclusion criteria were confirmed BA diagnosis and sufficient skill in the Dutch language. We obtained ethical approval from the Medical Ethics Committee of our center (METc 2015/359), and informed consent was obtained.

2.2. Data collection

Both mothers and fathers were asked to fill out the questionnaires at three time points: T0, during hospitalization for KPE; T1, between one and two months after KPE; and/or T2, when the patients reached the age of 2–3 years. We collected information regarding the sociodemographic status of the parents and their children and regarding the medical status of the children. Successful KPE was defined as reaching at least once a bilirubin level <20 μmol/L (1.17 mg/dL) within 6 months after KPE. Complications of KPE as well as of LTX were graded according to the Clavien-Dindo classification. [12]

2.3. Measurements

Parents were asked to fill out a short demographic questionnaire. We collected data on psychosocial outcomes in parents, that is anxiety, stress and QoL, using validated questionnaires. Anxiety levels were measured using the shortened form of the State and Trait Anxiety Inventory (STAI). [13,14] Reference data for the STAI are provided by the questionnaire manual and based on 1838 working adults from the USA. [13] Stress levels were assessed by the means of the Perceived Stress Scale (PSS). [15] Reference data for the PSS are provided by the questionnaire manual and based on 2387 participants from the USA general population. [15] QoL in mothers and fathers of BA patients was assessed by means of the shortened version of the validated World Health Organization Quality of Life Questionnaire (WHOQOL-BREF). [16] Available reference data for the WHOQOL-BREF is based on 626 participants (age 54±16 y) from the general Dutch population. [16] Psychometric properties and reliability of the STAI, PSS and the WHOQOL-BREF are satisfactory. [16–18]

2.4. Data analyses

Participants with more than 20% of data on a questionnaire missing were excluded from analysis for that specific questionnaire. [19] In case of one missing answer for the 10 PSS questions, the mean score was substituted for that particular question in order to calculate a total score. [20] If a participant circled two answers for one question, the least extreme answer was registered.

Data were checked for its distribution and given as number (percentage), median (minimum to maximum value), or mean ± standard deviation (SD). Outcomes of anxiety, stress, and QoL, per parent, per time point were compared with a median score based on reference data from the general population, using the one-sample Wilcoxon Signed-Rank test. [13,16,20] Since the data from the general population were normally distributed [13,16,20], we considered the mean scores of the reference population similar to the median scores. Within participants, data were compared between time points using the paired Wilcoxon Signed-Rank test, and reported as standardized Z test statistics. The relationships between the different parental psychosocial outcomes and child-related factors were calculated by means of a Spearman's rho cor-

Table 1
Parental baseline characteristics.

Baseline characteristics (N = 52)	N	n	%
Female gender	52	31	60%
Age category	51		
- 18–24		2	4%
- 25–40		45	88%
- 41–55		4	8%
Marital status	51		
- Married or living together with partner		50	98%
- Separated/divorced		1	2%
Number of children in household	51		
- 1		17	33%
- 2		20	39%
- 3		13	26%
- 4		1	2%
Employed (fulltime or part-time)	49	44	90%
Highest completed educational level[a]	51		
- Low/intermediate		31	61%
- High		20	39%
Household income (euros per year)	44		
< 35.000		20	46%
> 35.000		24	54%

[a] Educational level according to the International Standard Classification of Education Fields of Training and Education (ISCED).

relation and interpreted as weak (0.10–0.29), moderate (0.30–0.49), or strong (0.50–1.00). [21] Due to the limited sample size per time point, we refrained from Generalized Linear Mixed Model analysis. We considered a p-value <0.05 as statistically significant. We captured data in Redcap [22] and performed analyses using IBM SPSS version 23.

3. Results

3.1. Patient characteristics

Fifty-two parents of 30 children with BA participated in this study. For 22 infants, both parents were included (23 mothers, 21 fathers), and for eight infants, only one parent was included (8 mothers). The flowchart of the inclusion process is shown in Fig. 1. During KPE hospitalization, parents completed the questionnaires at a median of 5 (−3 to 21) days after KPE. Twenty-seven parents (52%) completed questionnaires at more than one time point, of whom thirteen parents (25%) completed questionnaires at all three time points. Characteristics of the included parents and their children are reported in Table 1 and 2, respectively.

3.2. Psychosocial outcomes compared with reference values

Fig. 2 shows the psychosocial outcomes per time point. Compared with reference values from the general population, mothers reported 36% higher levels of anxiety during KPE hospitalization ($Z = 3.30$, $p = 0.001$, $n = 19$), 23% higher levels of anxiety 1–2 months after KPE ($Z = 2.17$, $p = 0.03$, $n = 16$) and 4% higher levels of anxiety when the child had reached the age of 2–3 years ($Z = 2.11$, $p = 0.04$, $n = 19$). Anxiety levels in fathers, and stress levels in both mothers and fathers, did not significantly differ from the reference population (Supplemental Table 1). At each time point, both mothers and fathers reported comparable or even higher QoL scores as the reference population (Supplemental Table 1). During KPE hospitalization, mothers reported 14% higher social QoL compared with reference values ($Z = 1.98$, $p = 0.05$, $n = 19$). One to two months after KPE hospitalization, mothers reported 4% higher environmental QoL compared with reference values ($Z = 2.06$, $p = 0.04$, $n = 17$). When the child was 2–3 years of age, fathers reported 13% higher environmental QoL compared with reference values ($Z = 2.04$, $p = 0.04$, $n = 14$).
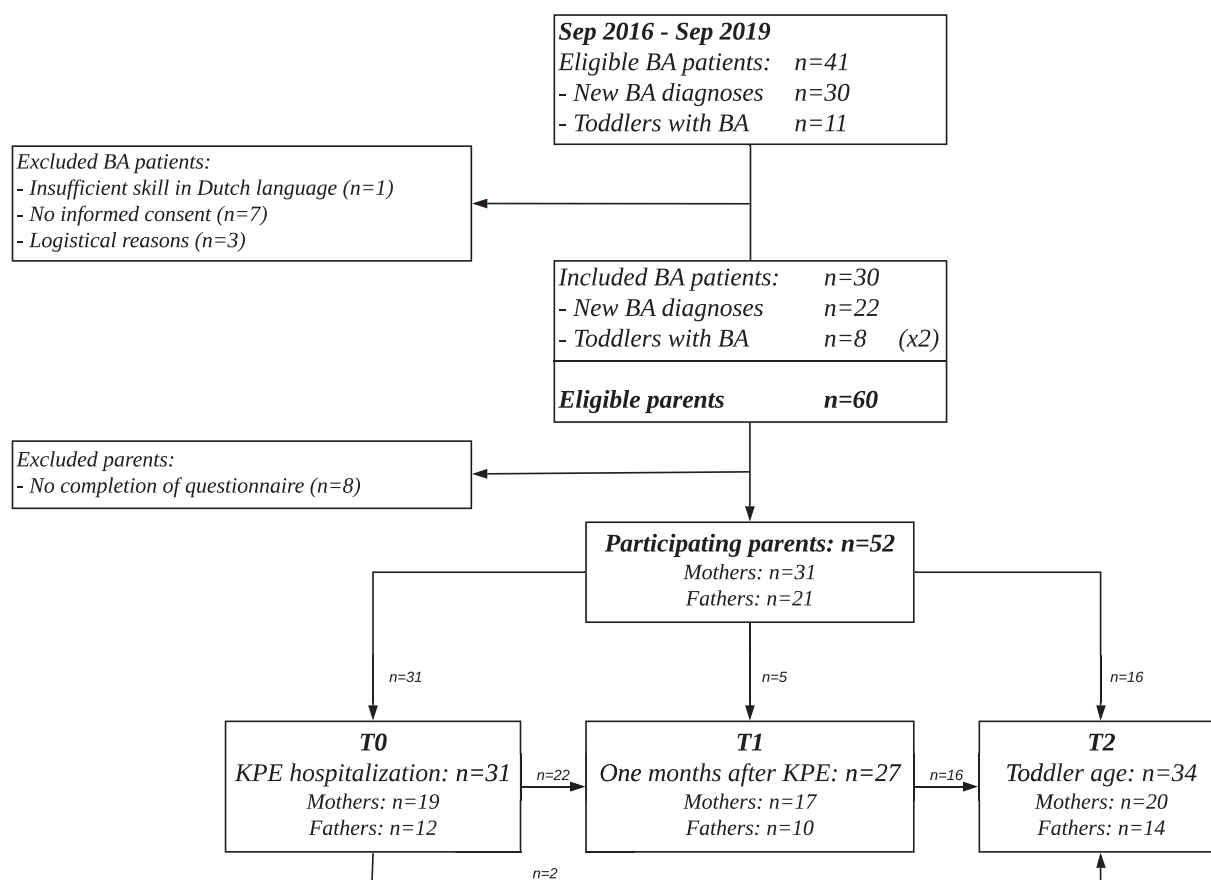
Sep 2016 - Sep 2019
Eligible BA patients: n=41
- New BA diagnoses   n=30
- Toddlers with BA   n=11

Excluded BA patients:
- Insufficient skill in Dutch language (n=1)
- No informed consent (n=7)
- Logistical reasons (n=3)

Included BA patients: n=30
- New BA diagnoses   n=22
- Toddlers with BA   n=8   (x2)

Eligible parents   n=60

Excluded parents:
- No completion of questionnaire (n=8)

Participating parents: n=52
Mothers: n=31
Fathers: n=21

n=31   *n=5*   *n=16*

T0
KPE hospitalization: n=31
Mothers: n=19
Fathers: n=12

n=22

T1
One months after KPE: n=27
Mothers: n=17
Fathers: n=10

n=16

T2
Toddler age: n=34
Mothers: n=20
Fathers: n=14

n=2

Fig. 1. Flowchart of the inclusion process.

Table 2
Child characteristics.

Child characteristics	N	n median	% min to max
Baseline characteristics (N = 30)			
Female gender	30	19	63%
Age first hospital admission (days)	28	49	11 to 131
Biliary Atresia Splenic Malformation Syndrome	30	3	10%
Highest total bilirubin level before KPE (μmol/L)[a]	30	163	87 to 364
Information regarding KPE (N = 29)			
Age at KPE (days)	29	57	27 to 143
Major complication post-KPE[b]	29	2	7%
Length hospital stay for KPE (days)	26	22	14 to 53
Total bilirubin level 1 month after KPE	29	107	20 to 201
Successful KPE[c]	29	12	41%
Information after 2–3 years of follow-up (N = 22)			
Age at screening LTx (months)	18	3	2 to 9
LTx	22	16	73%
Age at LTx (months)	16	7	4 to 22
Major complication post-LTx[a]	16	9	56%

[a] normal value <17 μmol/L.
[b] grade III-V of Clavien-Dindo Classification.
[c] bilirubin level <20 μmol/L (1.17 mg/dL) within 6 months after KPE

3.3. Change in psychosocial outcomes over time

Anxiety symptoms, as perceived by mothers, significantly decreased from 48 (23–65) during KPE hospitalization to 37 (20–60) after 2–3 years of follow-up ($Z=-2.29$, $p = 0.02$, $n = 10$). Stress levels in mothers significantly decreased from 18 (6–30) at 1–2 months after KPE to 13 (6–22) after 2–3 years of follow-up ($Z=-2.51$, $p = 0.01$, $n = 11$). In mothers, psychological QoL significantly decreased between 1 and 2 months after KPE and when the child reached the age of 2–3 years ($Z=-2.56$, $p = 0.01$, $n = 10$). In fathers, physical and environmental QoL significantly decreased between KPE hospitalization and 1–2 months thereafter (resp. $Z=-1.99$, $p = 0.05$, $n = 8$; and $Z=-2.38$, $p = 0.02$, $n = 8$).

3.4. Factors associated with psychosocial outcomes

Correlations between psychosocial outcomes in fathers and mothers and their socio-demographic and medical factors are pre-
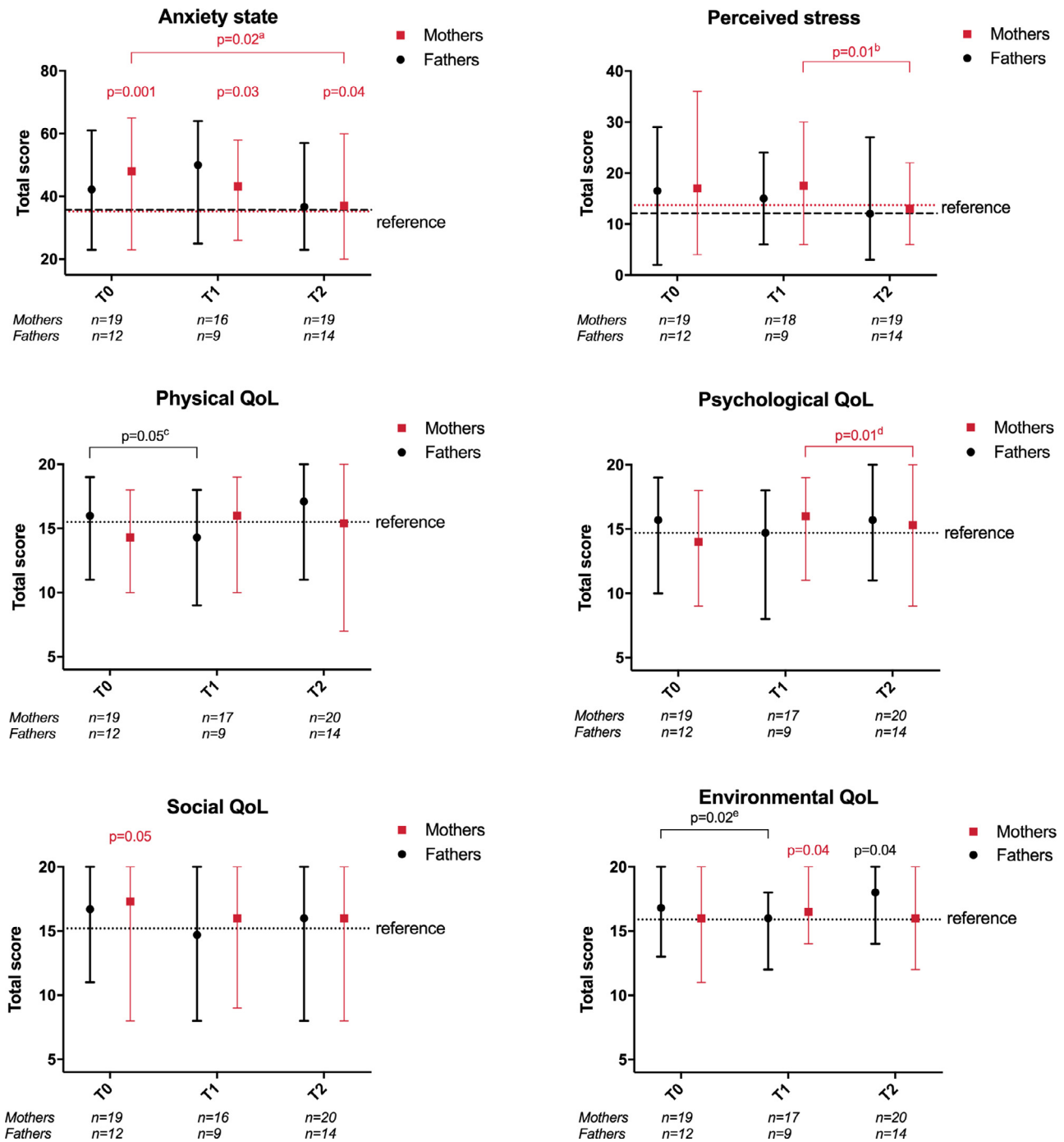
Fig. 2. Anxiety, stress and QoL scores (median, min to max) in mothers and fathers of BA patients during hospitalization for KPE (T0), at 1-2 months after KPE (T1) and after 2-3 years (T2). High QoL scores represent better QoL, whereas higher scores for anxiety and stress represent more symptoms of anxiety and stress. Scores are compared with reference values from the general population (single p-value) and within subjects between time points (p-value with bracket) using Wilcoxon Signed Rank analyses. [a]n=10, [b]n=11, [c]n=8, [d]n=10, [e]n=8.

sented in Table 3. Supplemental Tables 2 and 3, respectively, display these correlations for mothers and fathers separately.

4. Discussion

We aimed to determine anxiety, stress, and QoL in parents of infants who are diagnosed with BA. Up to 2–3 years after the diagnosis, particularly mothers reported high levels of anxiety. Over this time span, anxiety levels decreased but remained significantly higher than reference values from the general population. Elevated levels of anxiety and stress were strongly related

to lower QoL in both mothers and fathers. Our data show, however, that the overall QoL in parents of BA patients was relatively unaffected.

Our data on symptoms of anxiety and stress are in line with previous studies that showed that surgery in infancy could be a cause of great parental stress. [9,23] Similar to parents of children with an anorectal malformation or Hirschsprung disease, mothers of BA patients reported higher levels of anxiety compared to fathers. [24] The differences in psychosocial outcomes between mothers and fathers are to be expected, as it is well-recognized that women are more susceptible of developing symptoms of anx-

Table 3

Relationship between anxiety, stress and QoL as perceived by parents of children who are diagnosed with BA.

		Anxiety state		Perceived stress		Physical QoL		Psychological QoL		Social QoL		Environmental QoL	
		Rho	*p*	Rho	*p*	Rho	*p*	Rho	*p*	Rho	*p*	Rho	*p*
Anxiety trait[a]	T0	0.71	*<0.001*	0.80	*<0.001*	−0.89	*<0.001*	−0.86	*<0.001*	−0.64	*<0.001*	−0.70	*<0.001*
	T1	0.80	*<0.001*	0.59	*0.002*	−0.55	*0.004*	−0.65	*<0.001*	−0.46	*0.02*	−0.46	*0.02*
	T2	0.91	*<0.001*	0.66	*<0.001*	−0.69	*<0.001*	−0.84	*<0.001*	−0.53	*0.002*	−0.62	*<0.001*
Anxiety state	T0	N/A		0.58	*0.001*	−0.64	*<0.001*	−0.58	*0.001*	−0.43	*0.02*	−0.45	*0.01*
	T1	N/A		0.70	*<0.001*	−0.63	*0.001*	−0.69	*<0.001*	−0.62	*0.001*	−0.39	*0.06*
	T2	N/A		0.69	*<0.001*	−0.68	*<0.001*	−0.81	*<0.001*	−0.60	*<0.001*	−0.57	*0.001*
Perceived stress	T0	0.58	*0.001*	N/A		−0.78	*<0.001*	−0.82	*<0.001*	−0.66	*<0.001*	−0.67	*<0.001*
	T1	0.70	*<0.001*	N/A		−0.58	*0.002*	−0.77	*<0.001*	−0.48	*0.02*	−0.52	*0.008*
	T2	0.69	*<0.001*	N/A		−0.39	*0.02*	−0.64	*<0.001*	−0.45	*0.009*	−0.52	*0.002*
Number of children in household	T0	−0.22	*0.23*	−0.26	*0.17*	0.15	*0.44*	0.18	*0.32*	0.04	*0.83*	0.15	*0.43*
	T1	−0.15	*0.46*	−0.14	*0.51*	0.05	*0.81*	0.09	*0.68*	0.18	*0.40*	−0.03	*0.90*
	T2	0.00	*0.98*	−0.06	*0.76*	−0.01	*0.97*	0.16	*0.37*	−0.01	*0.96*	0.02	*0.90*
Household income >35.000 euros per year	T0	0.24	*0.22*	−0.18	*0.36*	0.16	*0.43*	0.06	*0.77*	−0.13	*0.52*	0.44	*0.02*
	T1	0.02	*0.92*	−0.11	*0.62*	−0.10	*0.64*	0.07	*0.76*	−0.16	*0.47*	0.23	*0.29*
	T2	0.06	*0.76*	−0.08	*0.67*	−0.20	*0.28*	−0.24	*0.20*	−0.26	*0.17*	−0.05	*0.78*
Total bilirubin level[b]	T0	0.06	*0.73*	0.14	*0.47*	−0.23	*0.21*	−0.19	*0.31*	−0.37	*0.04*	−0.04	*0.81*
	T1	0.46	*0.02*	0.10	*0.61*	−0.14	*0.50*	−0.04	*0.84*	−0.30	*0.14*	−0.07	*0.72*
Age KPE (days)	T0	−0.29	*0.11*	−0.32	*0.08*	0.24	*0.19*	0.27	*0.14*	0.12	*0.51*	0.29	*0.12*
	T1	−0.19	*0.37*	−0.12	*0.55*	0.00	*0.99*	0.13	*0.53*	−0.11	*0.59*	0.13	*0.54*
Complication post-KPE[c]	T0	0.17	*0.35*	−0.03	*0.88*	−0.11	*0.55*	0.02	*0.92*	0.11	*0.56*	0.05	*0.78*
	T1	−0.16	*0.43*	−0.28	*0.16*	0.11	*0.60*	0.24	*0.23*	0.18	*0.38*	0.01	*0.95*
Hospital stay KPE (days)	T1	0.50	*0.02*	0.68	*<0.001*	−0.47	*0.03*	−0.64	*0.001*	−0.36	*0.11*	−0.63	*0.002*
Successful KPE[d]	T1	−0.36	*0.08*	−0.18	*0.37*	0.07	*0.74*	0.27	*0.18*	0.26	*0.21*	0.27	*0.19*
	T2	−0.20	*0.29*	−0.33	*0.07*	0.08	*0.68*	0.09	*0.62*	−0.12	*0.51*	0.04	*0.82*
Age at screening LTx (months)	T2	−0.51	*0.007*	−0.39	*0.05*	0.55	*0.002*	0.50	*0.007*	0.39	*0.04*	0.36	*0.06*
Age LTx (months)	T2	−0.07	*0.74*	0.17	*0.41*	0.17	*0.41*	0.23	*0.27*	0.05	*0.81*	0.09	*0.65*
Complication post-LTx[c]	T2	0.31	*0.13*	0.01	*0.97*	−0.30	*0.13*	−0.38	*0.06*	−0.04	*0.84*	−0.40	*0.04*

Correlation coefficients were calculated by means of a Spearman's rho and can be interpreted as weak (0.10–0.29), moderate (0.3–0.49), or strong (0.50–1.0). T0, during hospitalization for KPE; T1, 1–2 months after KPE; T2, when the child had reached the age of 2–3 years.

[a] Anxiety trait reflects an individual's tendency to experience anxiety, i.e. anxiety trait.

[b] normal value <17 μmol/L.

[c] grade III-V of Clavien-Dindo Classification.

[d] bilirubin level <20 μmol/L (1.17 mg/dL) within 6 months after KPE.

iety and worry than men. [25] The fact that women are more likely to report on symptoms of anxiety and stress might explain the higher number of mothers participating in this study compared to fathers.

Parental QoL was comparable to, or for some domains even higher than, reference values. During hospitalization for KPE of their child, mothers reported significantly higher scores on social QoL compared with reference values. This suggests that mothers experience high levels of social support during the time around their child is being diagnosed with BA. This observation is in line with previous data on parents of children with an anorectal malformation or Hirschsprung disease. [24]

It warrants attention that, in our study, the scores in several QoL domains, as perceived by parents, decreased after BA diagnosis. In the first month after KPE hospitalization, fathers of BA patients reported a significant decrease in both physical and environmental QoL. These QoL domains comprise the amount of energy for everyday life, satisfaction of sleep, activities of daily living, work capacity, extent of leisure activities, and living conditions. A decrease in these domains in the first weeks after BA diagnosis may not be surprising due to the hospitalization and demanding amount of care for their sick newborn. Although levels of anxiety and stress decreased over time, mothers reported a significantly decrease in psychological QoL in the 2–3 years after KPE. Psychological QoL reflects the extent of positive and negative emotions, the satisfaction of concentration, appearance, oneself and the relevance of life. We speculate that these lower scores on the psychological QoL of mothers, years after the diagnosis, are related to the long-term impact of BA, both on the life of their child as well as on that of the parents themselves. Nevertheless, scores did not exceed psychological QoL at time of KPE hospitalization and were still comparable to the reference values.

Previously, we investigated the QoL of parents of children with BA who already reached school age. [10] We speculate that, over years, parents get accustomed with the chronic disease of their child, resulting in lower levels of anxiety and stress.

We studied factors that are associated with adverse psychosocial outcomes in parents in the first years after diagnosis. Prolonged duration of hospitalization for KPE was related with higher levels of stress and anxiety in parents, and with lower scores on all domains of QoL at each time point. Understandably, a successful KPE was related to a lower burden of anxiety as perceived by fathers, and to a better physical and psychological QoL one to two months after KPE. When the child had reached the age of 2–3 years, levels of anxiety and stress in mothers were adversely correlated with age at time of screening for LTx. Neither a history of LTx, nor age at LTx or complications after LTx were significantly correlated with psychosocial outcomes in parents of BA patients. In our center, parents of children were counseled for liver transplantation early in the post-KPE trajectory. Whether this has influenced parental anxiety and stress at follow-up remains uncertain.

Our data warrants attention for psychological outcomes in parents, particularly mothers, of newly diagnosed BA patients. At each time point, elevated levels of stress and anxiety were strongly related to lower parental QoL. Psychological support might reduce the burden of stress and anxiety in parents, and therefore might improve their QoL. Parental support might also be beneficial for the wellbeing of their infants, as it might improve the ability of parents to provide adequate care for their infants, and improve the emotional outcomes and health-related QoL of BA patients. [11,26]

This study holds several limitations. First, the rarity of BA makes it difficult to obtain large sample sizes. The small sample size limited the thorough identification of factors that are associated with psychosocial outcomes in parents. Second, this study

has a notable amount of missing data. This might affect the data analyses and choice of statistical models. Third, the time at which parents completed the questionnaires somewhat differed. The perception of QoL, or levels of stress or anxiety of parents may vary throughout the time of hospitalization. In addition, the age of the reference population was generally higher than that of the parents in our sample. Additionally, the reference values for the STAI and PSS are based on citizens from the United States of America. Therefore, the comparison with the reference population should be interpreted cautiously.

5. Conclusions

In conclusion, mothers of BA patients persistently report high levels of anxiety in the first years after BA diagnosis. Notwithstanding a decrease in symptoms of anxiety and stress over time, levels of anxiety remained significantly elevated. With this study, we provide unique data on psychosocial outcomes in parents of BA patients, in the first years after BA diagnosis. Although parental QoL appears to be largely comparable to the general population, parents with high levels of anxiety and stress are at risk of impaired parental QoL. The results of this study will allow healthcare providers to provide parents with information on the impact of BA diagnosis on parental wellbeing. Psychosocial support for parents after BA diagnosis is warranted, especially for those who experience high levels of anxiety and stress.

Financial disclosure

Declaration of Competing Interest

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jpedsurg.2021.05.026.

References

[1] Pinquart M. Parenting stress in caregivers of children with chronic physical condition—a meta-analysis. Stress Heal 2018;34:197–207. doi:10.1002/smi.2780.

[2] Cousino MK, Hazen RA. Parenting stress among caregivers of children with chronic illness: a systematic review. J Pediatr Psychol 2013;38:809–28. doi:10.1093/jpepsy/jst049.

[3] Lawoko S, Soares JJF. Quality of life among parents of children with congenital heart disease, parents of children with other diseases and parents of healthy children. Qual Life Res 2003;12:655–66. doi:10.1023/A:1025114331419.

[4] Franck LS, Cox S, Allen A, et al. Parental concern and distress about infant pain. Arch Dis Child Fetal Neonatal Ed 2004;89:F71–5. doi:10.1136/fn.89.1.f71.

[5] Kelly DA, Davenport M. Current management of biliary atresia. Arch Dis Child 2007;92:1132–5. doi:10.1136/adc.2006.101451.

[6] De Vries W, De Langen ZJ, Groen H, et al. Biliary atresia in the Netherlands: outcome of patients diagnosed between 1987 and 2008. J Pediatr 2012;160:638–44. doi:10.1016/j.jpeds.2011.09.061.

[7] Serinet MO, Wildhaber BE, Broué P, et al. Impact of age at Kasai operation on its results in late childhood and adolescence: a rational basis for biliary atresia screening. Pediatrics 2009;123:1280–6. doi:10.1542/peds.2008-1949.

[8] Wildhaber BE. Biliary atresia: 50 years after the first kasai. ISRN Surg 2012;2012:1–15. doi:10.5402/2012/132089.

[9] Lampela H, Pakarinen MP, Jahnukainen T, et al. Quality of life and parental worrying in a national cohort of biliary atresia children living with their native livers. J Pediatr Gastroenterol Nutr 2017;64:883–7. doi:10.1097/MPG.0000000000001516.

[10] Rodijk LH, Schins EMW, Witvliet MJ, et al. Quality of life in parents of children with biliary atresia. J Pediatr Gastroenterol Nutr 2020;71:641–6. doi:10.1097/MPG.0000000000002858.

[11] Kosmach-Park B. The impact of liver transplantation on family functioning in pediatric recipients: can 'healthy' families contribute to improved long-term survival? Pediatr Transplant 2013;17:321–5. doi:10.1111/j.1399-3046.2012.01728.x.

[12] Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004;240:205–13. doi:10.1097/01.sla.0000133083.54934.ae.

[13] Spielberger C. Manual for the state-trait anxiety inventory, Palo Alto (CA). Consulting Psychologists Press; 1983.

[14] Tluczek A, Henriques JB, Brown RL. Support for the reliability and validity of a six-item state anxiety scale derived from the state-trait anxiety inventory. J Nurs Meas 2009;17:19–28. doi:10.1891/1061-3749.17.1.19.

[15] Cohen S. Perceived stress scale - Mind Garden. Mind Gard; 1994.

[16] De Vries J, Den Oudsten B. Handleiding WHOQOL- 100 en WHOQOL-BREF. Herziene Versie [manual WHOQOL- 100 and Whoqol-Bref, Tilburg: Department of Medical and Clinical Psychology, Tilburg University; 2015. Revised version].

[17] De Vries J, Van Heck GL. The World Health Organization Quality of Life assessment instrument (WHOQOL-100): validation study with the dutch version. Eur J Psychol Assess 1997;13:164–78. doi:10.1027/1015-5759.13.3.164.

[18] Taylor JM. Psychometric analysis of the ten-item perceived stress scale. Psychol Assess 2015;27:90–101. doi:10.1037/a0038100.

[19] . WHOQOL user manual. In: WHO/HIS/HSI Rev.; 2012. p. 03. doi:10.1007/springerreference_28001.

[20] Cohen S. Perceived stress scale - 10-item version. Psychology Published Online First; 1994. doi:101037/t02889-000.

[21] Cohen J. Statistical power analysis for the behavioural sciences. Statistical power anaylsis for the behavioural science. 2nd edition. New York: Lawrence Erlbaum; 1988.

[22] Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)- a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 2009;42:377–81. doi:10.1016/j.jbi.2008.08.010.

[23] Lisanti AJ, Allen LR, Kelly L, et al. Maternal stress and anxiety in the pediatric cardiac intensive care unit. Am J Crit Care 2017;26:118–25. doi:10.4037/ajcc2017266.

[24] Witvliet MJ, Bakx R, Zwaveling S, et al. Quality of life and anxiety in parents of children with an anorectal malformation or hirschsprung disease: the first year after diagnosis. Eur J Pediatr Surg 2016;26:2–6. doi:10.1055/s-0035-1559885.

[25] McLean CP, Anderson ER. Brave men and timid women? A review of the gender differences in fear and anxiety. Clin Psychol Rev 2009;29:496–505. doi:10.1016/j.cpr.2009.05.003.

[26] Graham AM, Pfeifer JH, Fisher PA, et al. Early life stress is associated with default system integrity and emotionality during infancy. J Child Psychol Psychiatry Allied Discip 2015;56:1212–22. doi:10.1111/jcpp.12409.