

Paternal Mental Health and Socioemotional and Behavioral Development in Their Children

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KEY WORDS

father, mental health, child development, Norwegian Mother and Child Cohort Study

ABBREVIATIONS

CBCL—Child Behavioral Checklist

CI—confidence interval

ITSEA—Infant Toddler Social and Emotional Assessment

MoBa—Mother and Child Cohort Study

OR—odds ratio

SCL-5—Hopkins Symptom Checklist

SDQ—Strength and Difficulties Questionnaire

Ms Kvalevaag has made a substantial contribution to concept and design of the study and to the analysis and interpretation of data. She is the first author of the manuscript and thus has drafted it and has been responsible for coordinating the communication between coauthors in all stages of the work. Dr Ramchandani made a substantial contribution to the development of research questions and hypotheses and made suggestions for analyses to be performed. He thoroughly revised the manuscript several times and approved of the final version of the manuscript. Dr Hove contributed to the concept and design of the study, development of research questions and hypotheses, and interpretation of results. He critically revised the manuscript, including the final version before submission. Dr Assmus was central in the planning of the statistical models used and data analysis. He has revised the manuscript several times and given approval of the final version. Dr Eberhard-Gran contributed to design, interpretation of data, critical revising of the draft for this article, and approval of the version to be published. Dr Biringger made substantial contributions to the concept and design, analysis, and interpretation of data and critical revision of the draft. She approved of the final version of the manuscript before submission.

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WHAT'S KNOWN ON THIS SUBJECT: Paternal mental disorders during the postnatal period are associated with an increased risk for behavioral and emotional problems in their children; however, less is known about the effect of fathers' mental health during pregnancy on children's development.



WHAT THIS STUDY ADDS: The study demonstrated a positive association between fathers' prenatal mental health and their children's subsequent socioemotional and behavioral development. Psychological distress in fathers was associated with a risk for emotional difficulties in their children at 36 months of age.

abstract

FREE

OBJECTIVE: To examine the association between symptoms of psychological distress in expectant fathers and socioemotional and behavioral outcomes in their children at age 36 months.

METHODS: The current study is based on data from the Norwegian Mother and Child Cohort Study on 31 663 children. Information about fathers' mental health was obtained by self-report (Hopkins Symptom Checklist) in week 17 or 18 of gestation. Information about mothers' pre- and postnatal mental health and children's socioemotional and behavioral development at 36 months of age was obtained from parent-report questionnaires. Linear multiple regression and logistic regression models were performed while controlling for demographics, lifestyle variables, and mothers' mental health.

RESULTS: Three percent of the fathers had high levels of psychological distress. Using linear regression models, we found a small positive association between fathers' psychological distress and children's behavioral difficulties, $B = 0.19$ (95% confidence interval [CI] = 0.15–0.23); emotional difficulties, $B = 0.22$ (95% CI = 0.18–0.26); and social functioning, $B = 0.12$ (95% CI = 0.07–0.16). The associations did not change when adjusted for relevant confounders. Children whose fathers had high levels of psychological distress had higher levels of emotional and behavioral problems.

CONCLUSIONS: This study suggests that some risk of future child emotional, behavioral, and social problems can be identified during pregnancy. The findings are of importance for clinicians and policy makers in their planning of health care in the perinatal period because this represents a significant opportunity for preventive intervention. *Pediatrics* 2013;131:e463–e469

Psychiatric disorders in mothers are associated with an increased risk of socioemotional and behavioral problems in their children.^{1,2} However, studies of the predictive value of psychiatric disorders in fathers for the early psychosocial and behavioral development of their children are still scarce.⁵ Depression in expectant fathers may affect the mental health of their pregnant partners and thereby have indirect negative effects on neonatal outcomes.⁴ A prenatal effect of paternal psychological symptoms on their children may also reflect a genetic risk for psychopathology.⁵ A study by Matthey et al⁶ showed that prenatal paternal and maternal depressed mood were significant predictors for the postnatal mood of both mothers and fathers.

To our knowledge, only 2 previous studies have investigated the predictive value of prenatal paternal mental health for children's development. In 1 study, emotional and behavioral symptoms in children at ages 3.5 and 7 years were examined in relation to their fathers' depression prenatal status ($N = 7601$).⁷ After adjustment for a wide range of potential confounding factors (maternal depression, paternal education, marital status, and other children in the family), significant associations between fathers' prenatal depression and total problems on the Rutter Revised Preschool Scales at age 3.5 years were found. A similar pattern was also evident at 7 years of age.

In another prospective population based study, both mothers' and fathers' levels of depressive symptoms at 20 weeks of pregnancy were related to excessive crying measured by the parents in 2-month-old infants ($N = 4426$).⁸ After adjusting for mothers' depressive symptoms and relevant confounders (father's age, educational level, ethnicity, smoking, and alcohol use) paternal depressive symptoms

during pregnancy remained a risk factor for excessive infant crying in 2-month-old infants.

Our study examined whether an association existed between expectant fathers' mental health and socioemotional and behavioral problems in children at 36 months of age in a population cohort. We also sought to identify possible confounding factors in the association between fathers' prenatal mental health and their children's socioemotional and behavioral development.

METHODS

Participants

The Norwegian Mother and Child Cohort study (MoBa) is a prospective population-based pregnancy cohort study conducted by the Norwegian Institute of Public Health.⁹ Participants were recruited from throughout Norway from 1999 through 2008, and 38.5% of the invited women consented to participate. The cohort now includes 108 000 children, 90 700 mothers, and 71 500 fathers. The current study is based on version V of the quality-assured data files released for research. Informed consent was obtained from each MoBa participant upon recruitment. The study was approved by the Regional Committee for Medical Research Ethics in southeastern Norway, February 18, 2011. The analyses are based on data from 31 172 pregnancies, 28 733 fathers, and the resulting 31 663 children at 36 months age.

MoBa includes information about expectant fathers' mental health in week 17 or 18 of gestation, mothers' pre- and postnatal mental health and children's socioemotional and behavioral development at 36 months of age.

Measures

Demographic Covariates

The following sociodemographic variables were included: fathers' age,

education, marital status, somatic conditions, lifestyle variables, use of alcohol, cigarette smoking, and level of physical activity.

Predictor Variables

The Hopkins Symptom Checklist (SCL-5) is an indicator of level of global mental distress, mainly symptoms of anxiety and depression,¹⁰ and it has been used as a screening measure of psychological distress in several studies.^{11–13} SCL-5 correlates well with SCL-25 (Person's correlation = .92), and the corresponding cutoff points for SCL-5 is 2.00.¹⁴ The SCL-5 has 5 items: (1) Feeling fearful, (2) Nervousness or shakiness inside, (3) Feeling hopeless about the future, (4) Feeling blue, and (5) Worrying too much about things. Each of the items is scored on a 1 to 4 scale: 1 = not bothered, 2 = a little bothered, 3 = quite bothered, and 4 = very bothered. The average item score is computed by adding up the item scores and dividing the resulting sum score by the number of items.

Fathers' mental health was measured by SCL-5 (mean = 1.13, SD = 0.28, range 1–4). Of the 31 663 fathers, 205 (1%) had missing information on ≥ 1 items. Missing items on the SCL-5 were not replaced, which left $N = 31 458$ fathers with valid SCL-5 scores. The SCL-5 total scale was dichotomized at raw score 2.00.¹⁴ Three percent of the fathers ($n = 892$) had a score above the cutoff of 2.00.

Mothers' mental health was measured by SCL-5 (mean = 1.23, SD = 0.33, range 1–4). Of the $N = 31 655$ mothers, $n = 8$ (0.03%) had missing information on the SCL-5. The correlation between paternal and maternal mental health was not significant (Spearman's correlation [ρ] = 0.08).

Outcome Variables

The Strengths and Difficulties Questionnaire (SDQ)^{15–17} is used for assessment

of mental health in children. The questionnaire contains 25 items. MoBa included 5 items from this scale. SDQ is rated on a 3-point scale, 0 = not true, 1 = somewhat true, 2 = very true/often true. It is a parent-report instrument.

Infant Toddler Social and Emotional Assessment

The Infant Toddler Social and Emotional Assessment (ITSEA)¹⁸ is an adult-report measure of socioemotional problems and competencies in 1- to 3-year-old children. The complete ITSEA includes 166 items. Twenty-six items were included in the MoBa questionnaires. Items are rated on a 3-point scale: 0 = not true/rarely, 1 = somewhat true/sometimes, and 2 = very true/often.

Child Behavioral Checklist Revised

The Child Behavioral Checklist—Revised (CBCL)¹⁹ is an adult-report standardized instrument used for assessing a broad array of psychopathological manifestations in children from 1.5 to 5 years of age. It contains 100 items rated on a 3-point scale; 0 = not true, 1 = somewhat or sometimes true, 2 = very true/often true. Forty-four items from the CBCL were included in the MoBa questionnaires.

Operationalization of Children's Socioemotional and Behavioral Outcome Measures

Because not all items in the MoBa were included from several of the validated instruments, a procedure of operationalization of the available outcome measures was undertaken. The operationalization was based on a priori theoretical assumptions about underlying constructs, exploration of factor-structure using principal component analysis with Varimax rotation, and assessment of internal consistencies between items. Seventy-five items (5 items from the SDQ, 26 items from the

ITSEA, and 44 items from the CBCL) were used in the operationalization of 3 summary scales representing behavioral difficulties (mean log-transformed standardized summary score = 0, SD = 1, range -1.64 to 0.24), emotional difficulties (mean = 0, SD = 1, range -1.43 to 6.80), and social functioning (mean = 0, SD = 1, range -1.16 to 5.73). Of the total sample, 2777 (9%) children had missing scores on the 3 summary scales. Of the 31 663 father-child dyads, 22 dyads had missing in both fathers' SCL-5 and the 3 summary scales. These missing dyads were excluded from the analyses, thus leaving 28 703 in the inferential analyses in Tables 1, 2, 3, and 4.

Interitem correlations as measured by Cronbach's alphas were .65, .62, and .72 for the summary scales of behavioral difficulties, emotional difficulties, and social functioning, respectively. The 3 summary scales were used as outcome measures in the inferential analyses that follow. They were dichotomized at the 90th percentile to create a dichotomous outcome variable for use in the logistic regression analysis described here. Scores above this cutoff were used to indicate problems of clinical relevance.

Statistical Analysis

The associations between level of psychological distress as measured by the SCL-5 and the 3 summary scales representing child behavioral difficulties, emotional difficulties, and social functioning, respectively, were analyzed by means of linear regression models.

As fathers' level of education and child's gender are likely to confound the association between father's mental health and child's development, and as fathers' level of education varied in the descriptive statistics (Table 5), analyses were repeated with the sample stratified by fathers' level of education and by child's gender.

Furthermore, the interactions of fathers' mental health with fathers' level of education and fathers' mental health with child's gender were tested by interaction terms in general linear models.

Finally, logistic regression analyses with the SCL-5 total scale dichotomized at a raw score of 2.00 as the independent variable and each of the 3 summary scales of children's development dichotomized at the 90th percentile as dependent variables were performed to assess if high level of father's psychological distress was associated with higher odds ratios (ORs) for developmental problems in their children.

These associations were adjusted for fathers' age, education, marital status, somatic condition, alcohol use, cigarette smoking, and physical activity and for mothers' mental health. Categorically adjusted variables were entered as dummy-variables. The presumably healthiest category was used as a reference.

Tests were 2-tailed with the significance level set at .001 because of the large sample size. All analyses were conducted using SPSS PASW 18.0 for Windows.

Tests of high power are possible due to the large sample size. Because large sample size can lead to statistically significant effects that are nonetheless clinically irrelevant, we artificially reduced the sample size. We estimated all regression models (crude, fully adjusted, single adjusted) for 1000 bootstrap samples of $n = 500$ each.

RESULTS

Sociodemographic characteristics of the fathers in the total sample ($N = 31\ 663$) are presented in Table 5.

A positive association was found between fathers' psychological distress as measured by SCL-5 and children's

TABLE 1 Linear Regression Model for the Relationship Between Fathers' Psychological Distress as Measured by the SCL-5 and Summary Scales of Behavior Difficulties, Emotional Difficulties, and Social Functioning in Their Children

	SCL-5 (n = 28 703)		
	Behavioral Difficulties	Emotional Difficulties	Social Functioning
Crude			
B	0.19	0.22	0.12
95% CI	0.15–0.23	0.18–0.26	0.07–0.16
P	.000	.000	.000
Adjusted for education			
B	0.18	0.21	0.12
95% CI	0.14–0.23	0.17–0.26	0.07–0.16
P	.000	.000	.000
Fully adjusted model			
B	0.14	0.17	0.09
95% CI	0.10;0.18	0.13–0.21	0.05–0.14
P	.000	.000	.000

behavioral difficulties at 36 months of age: crude B = 0.19 (95% confidence interval [CI] = .15–.23), $P = .000$. The same was true for children's emotional difficulties: B = 0.22 (95% CI = 0.18–0.26), $P = .000$, and social functioning: B = 0.12 (95% CI = 0.07–0.16), $P = .000$ (Table 1). These associations did not change after adjusting for father's age, education, marital status, somatic conditions, use of alcohol, cigarette smoking, physical activity, and mothers' mental health.

The bootstrap evaluation confirmed the findings of the large sample estimation. In the analyses performed with fathers' mental health measured by SCL-5 as the independent variable and each of the 3 summary scales of children's development as the dependent variable

that were stratified by child's gender, effect sizes of associations were similar in boys and girls (Table 2). We also performed analyses with fathers' mental health as the independent variable stratified by fathers' level of education (high education/low education) and each of the 3 summary scales of children's development as the dependent variable. Effect sizes of this association were similar in both strata (Table 3).

Furthermore, the interaction terms of the SCL-5 total scale by father's education (high vs low level of education) were not significant in the prediction of the 3 summary scales of children's development ($P = .402$, $P = .494$, and $P = .114$ for the models with summary scales of children's behavioral difficulties, emotional difficulties, and social func-

tioning, respectively). The interaction terms of the SCL-5 total scale by child's gender were also not significant ($P = .727$, $P = .751$, and $P = .038$). This indicates that neither the father's level of education nor the child's gender moderated the associations between fathers' mental health and summary scales of children's development in the present sample.

The crude and adjusted results of the logistic regression analysis with SCL-5 dichotomized at 2.00 as the independent variable and the summary scales representing children's social functioning and emotional and behavioral difficulties with cutoffs set at 90th percentile as dependent variables are presented in Table 4. In the crude analysis with behavioral difficulties as the dependent variable, we found OR = 1.28 (95% CI = 1.04–1.58), $P = .02$, for emotional difficulties OR = 1.65 (95% CI = 1.36–2.00), $P = .000$, and for social functioning OR = 1.32 (95% CI = 1.08–1.62), $P = .007$. After adjusting for fathers' age, education, marital status, somatic condition, use of alcohol, cigarette smoking, physical activity and mothers' mental health, the pattern of effect sizes did not change. In the fully adjusted model, for behavioral difficulties, OR = 1.13 (95% CI = 0.91–1.40), $P = .3$; for emotional difficulties OR = 1.45 (95% CI = 1.19–1.77), $P = .000$; and for social functioning OR = 1.30 (95% CI = 1.06–1.59), $P = .01$.

TABLE 2 Linear Regression Model for the Relationship Between Fathers' Psychological Distress as Measured by SCL-5 and Behavior Difficulties, Emotional Difficulties, and Social Functioning in Their Children as Stratified by Gender

	Girls (n = 14 041)			Boys (n = 14 662)		
	Behavioral Difficulties	Emotional Difficulties	Social Functioning	Behavioral Difficulties	Emotional Difficulties	Social Functioning
Crude						
B	0.21	0.19	0.10	0.17	0.24	0.13
95% CI	0.15–0.27	0.14–0.25	0.04–0.15	0.11–0.23	0.19–0.30	0.07–0.19
P	.000	.000	.001	.000	.000	.000
Adjusted for education						
B	0.20	0.19	0.10	0.16	0.24	0.13
95% CI	0.15–0.26	0.13–0.25	0.04–0.16	0.10–0.22	0.18–0.30	0.07–0.19
P	.000	.000	.001	.000	.000	.000
Fully adjusted model						
B	0.16	0.14	0.07	0.12	0.19	0.11
95% CI	0.10–0.22	0.08–0.20	0.01–0.13	0.06–0.18	0.13–0.25	0.01–0.04
P	.000	.000	0.02	.000	.000	.000

TABLE 3 Linear Regression Model for the Relationship Between Fathers' Psychological Distress as Measured by SCL-5 and Behavior Difficulties, Emotional Difficulties, and Social Functioning in Their Children Stratified by Level of Education: High Level of Education = University /College, Low level of education = 9 y ground level /3 y of high school.

	High Level of Education (n = 14 444)			Low Level of Education (n = 13 142)		
	Behavioral Difficulties	Emotional Difficulties	Social Functioning	Behavioral Difficulties	Emotional Difficulties	Social Functioning
Crude						
B	0.18	0.23	0.10	0.18	0.18	0.12
95% CI	0.12–0.24	0.16–0.29	0.03–0.16	0.12–0.24	0.13–0.24	0.06–0.18
P	.000	.000	.003	.000	.000	.000
Fully adjusted model						
B	0.15	0.19	0.08	0.12	0.12	0.10
95% CI	0.08–0.21	0.13–0.26	0.01–0.14	0.06–0.18	0.06–0.18	0.04–0.16
P	.000	.000	0.02	.000	.000	0.001

DISCUSSION

The current study demonstrates that there is a consistent positive predictive association between fathers' prenatal mental health status and their children's socioemotional and behavioral development at 36 months of age. Children whose fathers had high levels of psychological distress had higher levels of emotional and behavioral problems.

To our knowledge, there are only 2 previous population-based studies of the association between fathers' mental health during pregnancy and their children's development. The findings in our study are in accordance with these studies.^{7,8} A number of possible mechanisms could account for this association. First, a prenatal effect of paternal psychological distress, in contrast to the postnatal effect of fathers'

psychological distress, may more accurately reflect a genetically transmitted risk to the child.⁵ Although this may account for some of the association seen, other mechanisms are also likely. In particular, depression in expectant fathers may also have an impact on the mental health of their pregnant partners and thereby have indirect negative effects on neonatal outcomes through an impact on the mothers.⁴ Finally a father's prenatal mental health is also likely to predict his mental health in the postnatal period, and this may account for some of the associations seen.⁶

In contrast with the findings of Lung et al,²⁰ our findings did not confirm that education had an effect on the association between fathers' mental health and child development. In contrast to other studies,^{7,21,22} we did not

find that gender had an effect on the associations found.

In accordance with previous studies,^{7,8,20} we controlled for possible confounding variables. However, the associations did not change after adjusting for fathers' age, marital status, somatic condition, alcohol use, cigarette smoking, physical activity, and mothers' mental health. Both father's and mother's showed relatively low scores on the SCL-5 in this study, and the correlation between fathers' and mothers' mental health as measured by SCL-5 in week 17 in pregnancy was weak.

Three percent of the fathers in our cohort had high levels of psychological distress, defined as scoring >2 on the SCL-5. This may not equate exactly to depression; however, a previous cohort did report similar findings. In a large cohort study, Ramchandani et al¹⁸ reported that 2.3% of fathers in their study were depressed in the prenatal period at 18 weeks. In contrast, Paulson and Bazemore²¹ found a meta-estimate prevalence of depression in the prenatal and postpartum period of 10.4%. These differences may reflect the use of different instruments, and the sample sizes of the studies also varied widely.²²

Strengths and Limitations

This is the largest prospective study to examine paternal mental health during pregnancy. By testing the association between fathers' mental health and their children's development in a population

TABLE 4 Logistic Regression Model for the Relationship Between Fathers' Psychological Distress as Measured by SCL-5 Dichotomized at 2.00 and Summary Scales of Behavior Difficulties, Emotional Difficulties, and Social Functioning in Their Children Dichotomized at the 90th Percentiles

	Summary Scale of Dimensions of Children's Psychosocial Development		
	Behavioral Difficulties, n = 29 912	Emotional Difficulties, n = 30 069	Social Functioning, n = 30 783
Crude			
OR	1.28	1.65	1.32
95% CI	1.04–1.58	1.36–2.00	1.08–1.62
P	.02	.000	.007
Adjusted for education			
OR	1.26	1.63	1.33
95% CI	1.02–1.55	1.34–1.97	1.09–1.63
P	.03	.000	.005
Fully adjusted model			
OR	0.13	1.45	1.30
95% CI	0.91–1.40	1.19–1.77	1.06–1.59
P	0.3	.000	0.01

TABLE 5 Sociodemographic Characteristics of Fathers in the Total Sample of Children ($N = 31\,663$), Frequencies and Percentages

Variable	n (%)
Age (y)	
≤19	65 (0.2)
20–24	1338 (4.2)
25–29	7966 (25)
30–34	12 810 (41)
35–39	6805 (22)
40–44	1986 (6)
45–49	516 (1.6)
≥50	175 (0.6)
Missing	2 (0)
Marital status	
Married	16 392 (52)
Cohabiting	14 562 (46)
Single	228 (0.7)
Divorced/separated	85 (0.3)
Widower	1 (0)
Missing	402 (1.3)
Education at baseline	
Secondary education	1141 (4)
3 y additional education	13 443 (42)
University/college ≤4 y	8583 (27)
University/college ≥4 y	7267 (23)
Missing	1236 (4)
Smoking	
Yes	4394 (14)
No	27 276 (86)
Use of alcohol	
Once/mo	8091 (26)
1–3 times/mo	18 553 (59)
2–7 times/wk	3885 (12)
Missing	1141 (4)
Physical activities	
4–6 times/wk	5427 (17)
1–3 times/wk	18 905 (60)
Never/<1 time/wk	6440 (20)
Missing	898 (3)
Somatic health problems	
No	25 671 (81)
Yes	5992 (19)

sample, the serious selection biases commonly found in clinical studies have largely been avoided.¹⁰ Furthermore, the sample size offers sufficient statistical power to detect small, relevant associations that would otherwise be missed. The prospective design of this study makes a child-to-parent effect less likely to be the cause of the effect found. Rather,

the association we found represents evidence for parent-to-child directionality.

A weakness of this study is the modest participation rate, 38.5%. Participation rates in cohort studies have decreased during the past 3 decades, from around 80% to 30% to 40%.^{23,24} The participation rate in the Danish National Birth Cohort was 39%,²³ and in the Taiwan Cohort study the participation rate was 41%.²⁰ The modest participation rate may lead to selection bias in the MoBa study. Nonparticipants are likely to be less educated, less affluent, less healthy, and unemployed compared with participants.²⁵ Nilsen et al²⁶ did a study comparing data from the MoBa study with information from the Medical Birth Registry for Norway (all women giving birth in Norway). They found that the prevalence estimates of exposure and outcome, but not the exposure-outcome associations, are biased. We assume that in this study, the low participation rate may have an effect on the prevalence estimates of fathers' psychological distress. The strength of the associations may have been reduced, and it may have an effect on generalizability of the results. In accordance with Nilsen et al,²⁶ we assume that it has not affected the validity of the associations studied.

Additional weaknesses of this study are that the measures of the predictor variables were self-reported and the outcome variables of children's development were based on mothers' reports. The use of self-report scales may be affected by rater bias. Previous studies have shown that parental reports of their children are highly reflective of "genuine" problems.^{27–29}

The SCL-5 questionnaire is a screening tool for depressive and anxious symptoms and cannot be used for diagnosing depression and anxiety. The gold standard for diagnosing mental illness is the clinical interview.

It is of note that only some items are used from each of the instruments in the MoBa. The exploratory factor analysis procedure was performed to strengthen the construct validity of the outcome variables in the study.

CONCLUSIONS

We found small but consistent prospective associations between expectant fathers' psychological distress and their children's subsequent socioemotional and behavioral development. These associations did not change after adjusting for fathers' age, education, marital status, somatic condition, use of alcohol, cigarette smoking, physical activity, and mothers' mental health. Longitudinal population-based studies of fathers and children, with or without psychological distress, are needed to further explore these associations and the role of mediating or moderating factors for the associations. Nonetheless, the findings from this study suggest that some risk for future child emotional and behavioral problems can be identified during pregnancy, and as such the results are of importance for health professionals and policy makers in their planning of health care in the perinatal period.

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