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1 Abstract

2 Objective

3 To compare pregnancy outcomes for women with and without severe fear of childbirth (FOC)
4 reported in the second trimester of pregnancy.

5 Methods

6 In a prospective cohort study, 389 singleton pregnancies were followed up using medical
7 records of participants in a study investigating FOC in Cork, Republic of Ireland. FOC was
8 measured using the Wijma Delivery Experience Questionnaire Part A (W-DEQ A). Severe
9 FOC was defined as W-DEQ A ≥ 85 , moderate FOC, W-DEQ-A 66-84 and low FOC, W-DEQ
10 A 0-65. Outcome measures were birthweight, birthweight centile, gestational age, and Apgar
11 scores at 1 minute and Apgar at 5 minutes. Linear regression was used to assess the association
12 between FOC and each outcome measure with adjustment for maternal age, smoking, parity
13 and marital status.

14 Results

15 There was no statistically significant difference in mean birthweight (mean difference = -0.03;
16 [95% CI: -444.69, 315.82]), mean birthweight centile (mean difference= 0.03; [95%CI: -15.97,
17 23.53]), or mean gestational age (mean difference= -0.06; [95%CI: -11.69, 4.82]) in women
18 with severe FOC (n=18) compared with women with low FOC (n=371). In the adjusted models,
19 there was only a slight correlation between severe FOC and Apgar scores at 1 minute (mean
20 difference= -0.09 [95%CI: -1.28, 0.32]) and Apgar scores at 5 minutes (mean difference= -0.18
21 [95%CI: -1.16, 1.08]).

22

23 Conclusion While a slight association was noted between severe FOC and Apgar scores, overall
24 findings are reassuring and could inform educational interventions which may alleviate FOC.
25 Awareness of FOC for health care professionals is vital to consider women's mental well-being.

26 Keywords

27 Pregnancy, fear of childbirth, tocophobia, outcomes, epidemiology

28 Introduction

29 Fear is a primal and basic emotion experienced universally [1]. Fear exists on a spectrum,
30 ranging from worries and minor fears, to high fear, and severe phobia[2]. Pregnant women
31 often experience worries and fear, including fear of childbirth (FOC). Severe FOC impacts
32 women's experience of pregnancy, manifesting in sleep disturbance and physical complaints
33 [3-5]. A Swedish study reported that 80% of pregnant women express some level of FOC, thus
34 it could be considered normal [6], but a recent meta-analysis suggested that up to 14% of
35 pregnant women could experience severe FOC worldwide [7].

36 FOC is categorised under the general umbrella of anxiety disorders in pregnancy [8] but is
37 considered a psychological domain in its own right [2]. A meta-analysis [9] examining the
38 difference between trait fear and trait anxiety concluded that fear has a distinct neurological
39 mechanism, separate from anxiety and is, therefore, a separate emotion. Thus, various tools
40 exist specifically to measure FOC [7]. The Wijma Delivery Experience Questionnaire Part A
41 (W-DEQ A) with a cut-off greater than 85 defining severe FOC is considered the gold standard
42 [10]. Psychometric analysis of the W-DEQ A [11] indicated the optimal cut-off value of 85 to
43 detect fear of childbirth which is clinically relevant according to the psychiatric DSM-5
44 diagnosis of fear of childbirth with 100% sensitivity and 93.8% specificity in an Italian
45 longitudinal study of nulliparous women (n=106).

46 Only one study to our knowledge previously examined the relationship between FOC and
47 pregnancy outcomes [12]. Rather than using the validated tool (the W-DEQ A) to assess
48 women's FOC levels, the previous study [12] was conducted by defining FOC using the
49 International Classification of Diseases code O99.80, a code allocated to women who attended
50 dedicated clinics for FOC using data from the Finnish Medical Birth Register to look at all
51 singleton births during the period 1997 to 2010 (n=788, 317). Findings of this study concluded

52 that both nulliparous and multiparous women with FOC had an association with lower
53 incidence of low birthweight, small for gestational age babies, preterm birth and low Apgar
54 score at one minute [12]. While this study was large, the definition of FOC used in the study is
55 a limitation, since it restricts the results to those who were diagnosed or who requested a
56 Caesarean and were thus referred to phobia clinics and excluded those who attended primary
57 care. It is possible that a true association was not captured due to an underestimation of the
58 incidence of FOC using the ICD-10, thus using the W-DEQ A ≥ 85 is a more robust definition.

59 We hypothesise that severe FOC may have an adverse impact on pregnancy outcomes. Various
60 factors may contribute to the possibility of adverse pregnancy outcomes in women with FOC.
61 FOC may be associated with increased risk of Caesarean Section [13], unintended pregnancy,
62 intimate partner violence [14] and a history of sexual abuse (adult or childhood) [15, 16]. Some
63 evidence proposes there is a relationship between a history of childhood sexual abuse and
64 preterm birth [17], and intimate partner violence has been correlated with low birthweight and
65 preterm birth [18]. Moreover, unintended pregnancy could mean that women are less likely to
66 have modified lifestyle behaviours such as smoking and alcohol consumption in early
67 pregnancy, which are well-established as deleterious [19]. Therefore, the aim of this study was
68 to compare the risk of adverse pregnancy outcomes for women with severe FOC as measured
69 using W-DEQ A ≥ 85 during pregnancy compared to women with lower levels of FOC.

70 Materials and Methods

71 This was a prospective cohort study of 389 women recruited in a maternity unit in the Republic
72 of Ireland. The study primary aims were to establish the prevalence and risk factors of FOC in
73 an Irish context [20]. A convenience sample of women attending routine antenatal care were
74 recruited by a research midwife undertaking doctoral studies, and by undergraduate students,
75 who were trained by the midwife to recruit participants, in 2015 and 2016. Findings and full

76 recruitment details are published elsewhere [20]. Full ethics approval was obtained from the
77 Cork Research Ethics Committee for the Teaching and Learning Hospitals [ECM 4 (06/01/15)
78 and ECM 3 (03/03/15)].

79 Inclusion criteria were; pregnant women ≥ 18 years, 12-24 weeks' pregnant and booked to give
80 birth in a large university-based tertiary maternity hospital (approximately 8,000 births
81 annually). Exclusion criteria were; women who self-determined they had insufficient English
82 to independently carry out the Questionnaire. Questionnaires were completed in clinics, after
83 research assistants gained written informed consent. Women were invited to provide their
84 medical records number to allow follow-up. Each woman completed a questionnaire including
85 socio-demographic and obstetric questions and the W-DEQ A. The W-DEQ A [10] consists of
86 33 questions using a Likert scale. A total score was calculated; with scores between 0 and 165
87 possible, scores 0-65, low fear, ≥ 66 , moderate fear, and a score ≥ 85 defining severe FOC [4,
88 10]. In Ireland at the time of the study, there were no phobia clinics available to women with
89 FOC and a formal diagnosis of FOC would be unusual due to a lack of awareness of perinatal
90 mental health [21].

91 Of 690 women invited to participate, 451 gave consent to postnatal data collection (65%).
92 Women who had incomplete W-DEQ A scores (n=29), stillbirths (n=2) and miscarriages (n=1)
93 were excluded due to incomplete datasets, and 21 women were lost to follow-up. For the final
94 analysis we excluded twin pregnancies (n=9), limiting to singleton pregnancies, in order to
95 increase homogeneity of the sample. Stillbirth was defined per the World Health Organisation
96 (WHO) definition [22] as the birth at, or after 28 weeks gestation of a baby with no signs of
97 life. Although there are various definitions of miscarriage, in this study, miscarriage was
98 defined as spontaneous fetal loss, from conception to 24 completed weeks gestation [23]. The
99 final study population consisted of 389 women.

100 Pregnancy outcome data were extracted from medical records by hand, directly from medical
101 records where possible, or from delivery logbooks and e-health record (Maternal and New-
102 born-Clinical Management System) as necessary in July 2017. Birthweight centiles were
103 calculated using a customised centile calculator for Irish mothers [24]. Outcome data were
104 entered into a secure encrypted SPSS file by the first author.

105 The following pregnancy outcomes were investigated for their association with severe FOC;
106 birthweight in grams, birthweight centile, gestational age in days, and Apgar scores at 1 minute
107 and 5 minutes.

108 Statistical analysis was performed using SPSS Version 22.0 Software programme (Chicago,
109 USA). Continuous variables were tested for normality using histograms and box plots, and
110 described using means and standard deviation (SD) if normally distributed, and median and
111 interquartile range (IQR) if not normally distributed. Due to non-normal distribution of the
112 data, a non-parametric technique (Kruskall-Wallis test) was used to test the hypothesis in
113 relation to Apgar scores. Analyses were conducted separately for nulliparous and multiparous
114 women to investigate outcomes in each group. A linear regression model was performed to
115 investigate the relationship between antenatal experience of FOC and neonatal outcome
116 (birthweight, birthweight centile, gestational age, and Apgar scores). Models were adjusted for
117 potential confounding factors: maternal age (<35 years vs ≥35 years), marital status (partner
118 vs no partner), smoking (smoker vs non-smoker) and parity (nulliparous vs multiparous).
119 Results were reported using the mean difference and 95% confidence intervals (CIs). For the
120 comparison of normally distributed continuous variables, the independent t-test was used and
121 Mann-Whitney U Test was performed for non-normally distributed data. An overall
122 significance level $p \leq 0.05$ was considered to be statistically significant and $p \leq 0.05$ also
123 considered significant for individuals mean difference of each analysis.

124 Results

125 In the final cohort, eighteen women (4.6%) had W-DEQ A ≥ 85 , 103 (26.5%) women had W-
126 DEQ A ≥ 66 , and 268 (68.9%) women had W-DEQ A ≤ 65 . Mean W-DEQ A score for the whole
127 sample was 55.42 (SD= 18.43). Women under 25 years had the highest mean W-DEQ A score
128 (60.53, SD=17.72). Married women had a lower mean W-DEQ A score (54.87, SD=18.37)
129 when compared with single women (60.52, SD=18.49). Nulliparous women had a higher mean
130 W-DEQ A score (59.17, SD=16.64) when compared with multiparous women (52.93,
131 SD=19.73). There was no difference in mean W-DEQ A score in women with no pregnancy
132 loss (55.67, SD= 17.96) versus those with one pregnancy loss (55.71, SD= 17.79). Women
133 with two or more pregnancy loss had a slightly lower W-DEQ A score (53.24, SD=22.49).

134 The mean birthweight in the total sample was 3521g (SD=542.41), mean birthweight centile
135 was 44.86 (SD=29.04), median gestational age was 279 days (IQR=12), median Apgar score
136 at 1 minute were 9.00 (IQR=1) and Apgar score at 5 minutes were 10.00 (IQR= 1) (Table 1).
137 In the exposure group (W-DEQ A ≥ 85), birthweight, mean gestational age, Apgar score at 1
138 minute and Apgar score at 5 minutes were similar overall (Table 1). There was an increase in
139 the mean birthweight and birthweight centile for nulliparous women with severe FOC (n=7),
140 3786g (SD=415.19), 45.59 (SD=24.39), in comparison with nulliparous women with low
141 exposure 3386g (SD=562.08), 36.17, (SD=25.97), but the number of women in this group is
142 too small to be reliable. Apgar score at 1 minute and Apgar score at 5 minutes were similar in
143 all groups except the severe FOC group, which had a mean Apgar score at 1 minute of 8.11 and
144 mean Apgar score at 5 minutes of 9.11. The results of the linear regression showed a significant
145 correlation between the exposure (severe FOC) and Apgar scores at 1 minute (mean
146 difference= -0.09 [95%CI -1.28, 0.32]) and Apgar scores at 5 minutes (mean difference= -0.18
147 [95%CI: -1.16, 1.08]) when adjusted for possible confounders (Table 2).

148 When labour and delivery outcomes were compared for women with W-DEQ A \geq 85 versus
149 those with W-DEQ A 0-84, there was no statistical difference in use of epidural analgesia,
150 induction of labour or Caesarean Section (Table 3).

151 Discussion

152 Overall, there was no evidence of an association between FOC and birthweight, birthweight
153 centile, or gestational age. There was a statistically significant difference in relation to severe
154 FOC and Apgar scores however, this association is not clinically relevant. This study rejects
155 our hypothesis that there is an association between antenatal experience of severe FOC and
156 adverse pregnancy outcomes.

157 One possible explanation of this finding that FOC may not be associated with negative
158 outcomes is that women have increased opportunities during the second trimester to ask doctors
159 and midwives questions, which may alleviate FOC and provide reassurance, rather than earlier
160 on in pregnancy, when typically women have few antenatal appointments.

161 Only one previous study [12], to our knowledge investigated a relationship between FOC and
162 pregnancy outcomes. Our study confirms the findings of this large population-based
163 epidemiological study [12] conducted using the Finnish Medical Birth Register which found
164 no relationship between severe FOC and pregnancy outcomes.

165 Strengths and Limitations

166 The main strength of the present study is that, to our knowledge, it is the first to investigate
167 FOC and pregnancy outcomes using the W-DEQ A.

168 Data were complete for the majority of variables. Study limitations must be acknowledged.
169 The W-DEQ A was measured once, in the second trimester, but FOC may be triggered at any
170 point during pregnancy, thus a study which measured FOC in the first and/ or third trimester

171 may find different results. The study used a convenience sample which limits the
172 generalizability of the findings. The sample consisted of mainly Caucasian women, therefore
173 a study including a more heterogeneous sample or women with a different ethnicity may result
174 in different findings. The analysis was not adjusted for potential confounding factors related to
175 pregnancy complications or high risk pregnancy. It must be acknowledged that the number of
176 women with severe FOC in the sample were small (n=18), therefore the study was not
177 adequately powered which led to wide confidence intervals. However, the prevalence of
178 women with FOC (4.3%) in this study is similar to the findings of previous studies in other
179 countries which also found a prevalence of approximately 5% [7]. Finally, the Finnish study
180 [12] reported other pregnancy outcomes which we did not, such as incidence of low birthweight
181 (<2500g), and small for gestational age babies.

182 Conclusions

183 This study suggests maternal exposure to severe FOC in the second trimester of pregnancy has
184 no adverse impact on birth weight, birth weight centile, and gestational age or Apgar scores.
185 Findings of this study are reassuring and may be useful to inform women and clinicians, adding
186 to our limited understanding of severe FOC in an Irish context, highlighting similarities
187 between Finnish and Irish populations. Awareness of FOC in health care professionals is vital
188 to integrate management of FOC in antenatal care and enhance emotional support for women,
189 which may result in a reduction in medical interventions and Caesarean Section rates. Further
190 research should focus on investigating pregnancy outcomes in other countries and in different
191 ethnic groups. In addition, future studies should evaluate the pregnancy outcomes of women
192 with FOC in the first or third trimester.

193 Conflicts of interests

194 The authors have no potential conflicts of interest to disclose. The authors have no financial
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204 conceived and designed the study. Maeve O’Connell recruited participants, collected the data
205 and performed the analysis with advice from Dr Ali Khashan. All authors read and contributed
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Table 1. Gestational age, birthweight, birthweight centile and Apgar scores and antenatal experience of fear of childbirth

Variable	Gestational Age, days median, IQR (n)			Birthweight, g mean, SD (n)			Birthweight centile mean, SD (n)			Apgar at 1 minute median, IQR (n)			Apgar at 5 minutes median, IQR (n)		
	Total Sample	Nulliparous women	Multiparous women	Total Sample	Nulliparous women	Multiparous women	Total Sample	Nulliparous women	Multiparous women	Total Sample	Nulliparous women	Multiparous women	Total Sample	Nulliparous women	Multiparous women
Overall Sample W-DEQ 0-165	279, 12 (389)	281, 14 (120*)	278, 10 (266)	3521± 542 (389)	3422±553(122)	3568± 532 (266)	45±29 (389)	36±6 (120*)	49±29 (265*)	9., 0 (389)	9, 0 (122)	9, 0 (264*)	10, 1 (389)	10, 1 (122)	10, 1 (264*)
Low Exposure W-DEQ A 0-65	278, 11 (268)	280, 15 (76*)	277, 10 (189)	3529± 562 (268)	3387±600 (78)	3590± 537(189)	46±29 (268)	36±26 (76*)	50±29 (189)	9, 0 (268)	9, 0 (78)	9, 0 (187*)	10, 1 (268)	10, 0 (78)	10, 1 (187*)
Moderate Exposure W-DEQ A 66-84	280, 11 (103)	284, 12 (37)	278, 11 (65*)	3492± 478 (103)	3427±448 (37)	3529± 494 (66)	40±29 (103)	33±26 (37)	44±30 (65*)	9, 0 (103)	9, 0 (37)	9, 0 (66)	10, 1 (103)	9, 1 (37)	10, 1 (66)
Exposure W-DEQ A 85-165	281, 16 (18)	285, 8 (7)	274, 26 (11)	3566± 609 (18)	3788±415 (7)	3425± 686 (11)	54±28 (18)	46±24 (7)	60±30 (11)	9, 1 (18)	9, 0 (7)	9, 1 (11)	9, 1 (18)	9, 1 (7)	9, 1 (11)

SD=Standard Deviation, W-DEQ A= Wijma Delivery Experience Questionnaire Part A, *=missing data

Table 2. Results of linear regression predicting gestational age, birthweight, birthweight centile and Apgar score

Variable N	Gestational Age, days		Birthweight, g		Birthweight Centile		Apgar at 1 minute		Apgar at 5 minutes	
	Co-efficient (95%CI)		Co-efficient (95%CI)		Co-efficient (95%CI)		Co-efficient (95%CI)		Co-efficient (95%CI)	
	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted
Overall Sample (continuous) W-DEQA 0-165 N=389	0.04 (-0.09, 0.14)	0.06 (-0.03, 0.10)	0.12 (-1.94, 9.69)	0.02 (-2.39, 3.48)	0.11 (-0.11, 0.45)	-0.11 (-0.18, 0.14)	-0.04 (-0.01, 0.01)	-0.06 (-0.01, 0.01)	0.36 (-0.01, 0.01)	-0.09 (-0.01, 0.01)
Low Exposure W-DEQ A 0-65 n=268	-	-	-	-	-	-	-	-	-	-
Moderate Exposure W-DEQ A 66-84 n=103	0.08 (-2.23, 6.43)	0.11 (0.27, 5.54)	-0.09 (-305.61, 92.91)	-0.03 (-161.42, 83.87)	-0.14 (-19.68, 1.01)	-0.10 (-13.29, - 0.18)	0.06 (-0.27, 0.56)	0.04 (-0.15, 0.36)	-0.07 (-0.34, 0.14)	-0.02 (-0.18, 0.11)
Exposure W-DEQ A 85-165 n=18	-0.06 (-11.69, 4.82)	-0.06 (-8.75, 2.37)	-0.03 (-444.69, 315.82)	0.02 (-210.22, 305.13)	0.03 (-15.97, 23.53)	0.07 (-4.14, 23.51)	-0.09 (-1.28, 0.32)	-0.11 (-1.16, - 0.08)	-0.18 (-1.03, - 0.12)	-0.16 (-0.81, - 0.19)

Table Legend: W-DEQ A= Wijma Delivery Experience Questionnaire Part A
Adjusted for Age, Marital Status, Parity, Smoking

Table 3. Comparison of labour and delivery outcomes of women with and without a severe fear of childbirth

Labour and delivery outcome	W-DEQ A \geq85, n (%)	W-DEQ A \leq84, n (%)	p
Epidural analgesia	7 (1.8)	140 (35.9)	0.39
Induction of labour	5 (1.3)	130 (33.4)	0.57
Pre-labour Caesarean	5 (1.3)	44 (11.3)	0.06
Caesarean in labour	4 (1.0)	53 (13.6)	0.31

Table Legend: W-DEQ A= Wijma Delivery Experience Questionnaire Part A
p<0.05= significant

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