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ABSTRACT

Objectives: Being born with an orofacial cleft (OFC) can, due to an incomplete closure of the lip and/or palate, convey a deviant speech and/or deviant facial aesthetics, which may in turn increase the risk for poor psychological health later in life. Previous investigations have been based on small samples and self-reports, not distinguishing between the three different types of OFC: cleft lip (CL), CL and palate (CLP) and cleft palate only (CPO). We present a large population-based study, considering psychotropic drug use as a proxy for poor psychological health and distinguishing between three different types of OFC.

Design and methods: Using the *Swedish Medical Birth Register*, and linking to it the *Swedish Prescribed Drug Register*, the *National Mortality Register*, the *Emigration Register* and the *National Inpatient Register*, we identified all singletons born to native mothers in Sweden between 1987 and 1993, alive and residing in Sweden at the end of an 18-year follow-up period (N=626 109). We compared psychotropic drug use among individuals with and without OFC during the individuals' adolescence (2005–2008) by multiple logistic regressions, using ORs with 95% CIs.

Results: When adjusted for potential confounders, having a CL (OR=1.63, 95% CI 1.08 to 2.46) or a CPO (OR=1.54, 95% CI 1.18 to 2.01) increased the risk of psychotropic drug use. Results were not significant regarding adolescents who had a CLP (OR=1.21, 95% CI 0.81 to 1.80).

Conclusions: Being born with a CL or a CPO increases the risk for psychotropic drug use in adolescence, but not for adolescents born with a CLP. Our findings suggest that, since the three OFC types are associated with different long-term risks of poor psychological health, the three groups should be studied separately concerning long-term psychosocial consequences.

Strengths and limitations of this study

- Previous studies regarding the psychological health of adolescents born with an orofacial cleft (OFC) have been based mainly on small samples and self-reported data and are therefore heterogeneous in their findings and limited in their generalisability. In contrast, the present study was based on epidemiological data from a large Medical Birth registry and assessment of risks for poor mental health associated with OFC was based on data on dispensed prescribed medication, rather than self-reports.
- While most research regards two subgroups of patients with facial clefts, cleft lip with or without cleft palate (CL/P) and cleft palate only (CPO), this study regards cleft lip (CL) and CL and palate (CLP) as two distinct subgroups. Importantly, results suggest that being born with a CPO, as well as with a CL, increases the risk for use of psychotropic drugs, compared with unaffected controls, but not for children born with a CLP.
- There is clinical significance in our findings: Children with a CL and their parents may need to receive more attention than in current praxis as usual, in order to assist a prevention of long-term adverse consequences of the initial condition. In addition, if adolescents born with a CL react differently to their condition than those born with a CLP, treating CL and CLP as one group is likely to lead to misconceptions concerning the needs of these patients and their families.
- This study regarded psychotropic drug use as a proxy for poor mental health. This may have resulted in an underestimation of poor mental health among adolescents, as other non-medical treatments were not considered.
- Children with OFC malformations may suffer from other pathologies that may also be associated with increased poor mental health. Despite statistical adjustment to avoid this confounding, it cannot be excluded that some confounding disorder was missed.

INTRODUCTION

In Sweden, around 2 of 1000 children are born with an orofacial cleft (OFC),[1] a condition characterised by an incomplete closure of the lip, upper jaw and/or palate.[2] As being born with an OFC can be traumatic for a child and its parents,[3–5] possibly negatively influencing his/her psychosocial development, several studies addressing psychological health in children and adolescents born with OFCs have been conducted.[6–10] However, the

findings are diverse: While one study showed that maternal mental health affects the child's coping with her/his OFC,[6] in another study the child seemed unaffected by the mother.[11] There is evidence that children with OFC suffer from psychosocial problems,[12–14] as well as evidence contradicting this notion[6 15] and even a *more positive* self-concept among children with OFC, compared with controls, has been reported.[16 17] This heterogeneity may partly be due to methodological differences or limitations in the conducted studies. Most previous investigations are based on small samples, selected patient populations and self-reported information. As these limitations threaten generalisability, a need for larger population-based studies has been expressed.[18 19]

Another possible explanation for this heterogeneity is that the three types of OFC, cleft lip (CL), CL and palate (CLP) and cleft palate only (CPO), are often considered together; in particular, CL and CLP are treated as one group (CL/P). Nonetheless, what distinguishes these three conditions from each other has been shown to be of importance. In CL, facial aesthetics are affected, particularly the upper jaw and the nose, and there may be some impact on speech development.[20] Yet speech development is more strongly affected in children born with a CLP, as they also suffer from an incomplete closure of their palate,[21] creating a characteristic, deviant speech termed "the cleft palate speech".[1 7 19] CLP can also lead to a hearing impairment and difficulties with breast feeding during infancy.[22] These problems also affect children born with a CPO,[23] but the aesthetic concerns are not equally strong as children in this group have a complete lip closure.[24 25]

Indeed, physical facial abnormalities and severity of speech impairment have been related to challenged psychosocial health in affected children,[21 26 27] perhaps mediated by how the affected child is perceived by others.[28 29] Furthermore, how different types of OFC are related to psychological well-being may vary across development.[17 27] When the child is approaching adolescence, an emotionally turbulent period when peer acceptance becomes increasingly significant, both speech impairment and aesthetic concerns associated with OFC become increasingly important for the child's quality of life.[4 15 27 30]

A large population-based analysis produced little evidence that individuals with OFC are at increased risk for psychopathology of such nature and severity that it requires hospitalisation.[31] However, poor mental health can be suffered, with detrimental effects on well-being and quality of life, without any hospitalisation being involved. In addition, to the best of our knowledge, there are no large population-based studies investigating the impact of OFC on psychological health during adolescence, and there are no studies examining the different types of OFC separately. Therefore, the main aim of this study was to improve our knowledge on the psychological health of adolescents affected by an OFC, so as to disentangle the effect of specific OFC malformations. Using the Swedish nationwide healthcare registers, we conducted a large epidemiological study including all adolescents being born to native Swedish mothers between 1987 and 1993, who were alive and residing in Sweden at the end of a follow-up period (2005–2008). We investigated the use of psychotropic drugs in adolescence in relation to congenital OFC malformations, considering *use of psychotropic medication* as a surrogate of *impaired psychological health*. This approximation has been used previously[32 33] and seems appropriate in a homogeneous and accessible healthcare system, as is the case in Sweden, and adequate for capturing a broad spectrum of poor mental health conditions that cannot be ignored but that may not require hospitalisation.

METHODS

Participants and procedures

We obtained a database derived from the *Swedish Medical Birth Register* linked to other national databases such as the *Swedish Prescribed Drug Register*, the *National Mortality Register*, the *Emigration Register* and the *National Inpatient Register*. These registers, administered by Statistics Sweden and by the National Board of Health and Welfare, are linked using personal identification numbers assigned to each person residing in Sweden. In the data we received, identification numbers were replaced with arbitrary numbers, thereby securing anonymity. We identified all children born in Sweden during the period 1987–1993 (N=811 599). As there is evidence of an underuse of psychotropic drugs in relation to the needs of adolescent descendants of migrant women,[33] potentially confounding the outcomes analysis in this study, we excluded children of parents born outside Sweden. We also excluded children who were not singletons, died or emigrated from Sweden before 31 December 2008 (end of follow-up period). The final cohort consisted of 626 109 adolescents (figure 1).

Measures

Outcome variables

OFC: We identified all children registered with an OFC in the Patient Register and/or in the Medical Birth Register, by their International Classification of Diseases, Ninth Revision (ICD-9) and/or ICD-10 diagnoses (WHO, 2011b), and categorised them into four subgroups: CL, CLP, CPO and Unspecified OFC. The ICD-codes for CL were 749B (ICD-9) and Q36 (ICD-10), for CLP the codes were 749C (ICD-9) and Q37 (ICD-10), and finally for CPO the codes were 749A and Q35 for ICD-9 and ICD-10, respectively. The "Unspecified OFC" group consisted of those cases where the type of OFC was not clear (for instance, if more than 1 of the different types of OFC was registered for the same child or registered only with the ICD-9 code 749). In the analyses, we set children without any OFC as a reference in the comparisons.

Psychotropic drugs: We obtained information about prescribed and dispensed psychotropic drugs from the

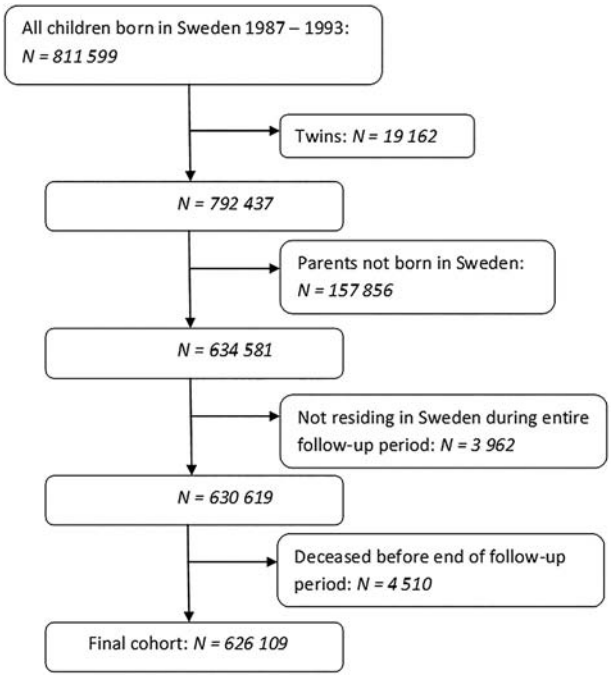

Figure 1 Study population.

Swedish Prescribed Drug Register, which records standardised information on all prescribed drugs in open healthcare that are dispensed at pharmacies in Sweden. However, information on medication use within hospitals and nursing homes is not recorded in the Swedish Prescribed Drug Register. We distinguished five categories of psychotropic drugs according to the Anatomical Therapeutic Chemical (ATC) classification system (WHO, 2011a): antipsychotics (N05A), anxiolytics (N05B), hypnotics and sedatives (N05C), antidepressants (N06A) and psychostimulants (N06B). The register contains individual information on medication starting 1 July 2005, which conditions the period of analysis for this study. We defined the outcome variable as at least one dispensed prescription[33] of any of these drugs from 1 July 2005 to 31 December 2008 (yes/no).

Other child characteristics

Birth year: We included birth years 1987–1993. Children born in 1993 were set as the reference group for comparisons.

Sex: Girls are more at risk for CPO while boys are overrepresented among children born with a CL or a CLP.[34] Also, girls are in general consuming more psychotropic drugs than boys.[35] Therefore, we set boys as the reference group for comparisons.

Small for gestational age (SGA): Babies born with a CLP or a CPO are more likely to be SGA than children without any OFC,[36] while being SGA is suggested to be related to impaired psychological health[37] later on. Thus, we identified children registered in the Medical Birth Registry as SGA[38] and dichotomised the variable into 'child being SGA' or 'child not being SGA'. Data were missing for a few cases (N=1417), which we recoded into a separate group 'missing'. We set 'Not SGA' as the reference group for comparisons.

Other significant malformation (OSM): OFCs are often associated with other disorders.[39–43] As these accompanying pathologies may increase the risk of impaired psychological health, we adjusted in our analyses for the presence of "OSM" according to the definition provided by the Swedish National Board of Health and Welfare.[44] The variable OSM is computed by this authority following standardised criteria.[44] Children who did not present any of these diagnoses in our registries were considered as the reference group in the comparisons.

Mother characteristics

Age at delivery: We classified maternal age at delivery into six groups (<20, 20–24, 25–29, 30–34, 35–39, >39 years). Mother's age at delivery has been found to be a risk factor for giving birth to a child with an OFC;[45] however, this risk seems to differ with cleft type.[46] Mother's age may also affect the risk for the offspring developing poor psychological health.[47] We considered mothers younger than 20 years at the time for delivery as the reference in the comparisons.

Smoking: Information regarding mother's self-reported smoking status was collected when she was first assigned to antenatal care (between the 8th and 12th gestational week). Maternal smoking during pregnancy has been associated with giving birth to a child with an OFC[48 49] and with behavioural difficulties in the child.[50] We categorised smoking habits into four categories: 'no smoking', 'light smokers (1–9 cigarettes/day)', 'heavy smokers (>9 cigarettes/day)' and 'no information' where there were missing values (N=37 477). The non-smoking group was considered as the reference.

Congenital malformation: OFCs are to some extent genetic.[51–53] Therefore, we identified mothers being admitted to hospital with any of the following diagnoses used to register congenital malformations: ICD 10-codes Q00–99, respectively, ICD 9-codes 740–758. Mothers who were never admitted to hospital with one of those diagnoses were set as the reference.

Statistical analysis

In a first step, we hypothesised and probed variables (confounders) that may be associated both with being born with an OFC (subgroups analysed separately) and with prescription of psychotropic drugs. In cases where two variables showed multicollinearity, we selected the variable that provided a better goodness of fit by means of a χ^2 test (eg, mother's age at delivery compared with parity, where the latter 1 was excluded). Next, we applied logistic regression analysis in two consecutive models to investigate the association between the different types of OFC and the use of psychotropic drugs in adolescence. In the first model, we investigated the bare association, that is, before adjusting for potential confounders, between being born with an OFC and the use of psychotropic drugs in adolescence. In the second

model (table 1), we adjusted for potential confounders (ie, sex, birth year, OSMs, SGA, maternal smoking, mother's age at delivery and mother congenital malformation) and obtained ORs and 95% CIs. Since the prevalence of congenital OFC anomalies is very low, ORs are an appropriate approximation of the relative risk.[54] We used IBM SPSS Statistics for Windows, V.20.0, for the analyses.

RESULTS

Overall, 2.2 per 1000 (1 334 of 626 109) children were born with an OFC. Of those, 247 children were born with a CL, 318 with a CLP, 542 with a CPO and 228 with an Unspecified OFC. Table 1 summarises the characteristics of the population affected by an OFC and the population not affected. The proportion of children born with some type of OFC, compared with children born without an OFC, was roughly the same for all years (1987–1993). Children affected by a CLP, CPO and Unspecified OFC, who were also SGA, were in addition more likely to have had other congenital malformations, but this was not the case for children with a CL. Girls were under-represented in the CL, CLP and Unspecified OFC groups but over-represented in the CPO group.

Concerning maternal characteristics, a higher percentage of mothers to children born with a CL or a CPO smoked heavily (over 9 cigarettes per day) during pregnancy, and more mothers of children born with CLP and CPO had been hospitalised with a congenital malformation. Also, there were fewer mothers older than 35 years of age among children born with a CL, for the CLP group there were fewer mothers in the age group 30–34 while the opposite pattern was observed for mothers to children born with a CPO (table 1).

Table 2 presents the OR for using psychotropic drugs in relation to the presence of an OFC and in relation to possible confounders. In the unadjusted model, it appeared that being born with a CPO increased the risk of using psychotropic drugs in adolescence, compared with individuals without an OFC. Furthermore, closer analysis revealed that the diagnostic subgroups behaved differently: adolescents born with a CLP or with an Unspecified OFC did not seem to be at greater risk of being prescribed psychotropic medication, compared with unaffected controls, but the risk of being

Table 1 Characteristics of the population (N=626 109) by presence of congenital OFC distinguishing between CL, CLP, CPO and Unspecified OFC

	No OFC N=624 774	CL N=247	CLP N=318	CPO N=542	Unspecified OFC N=228
Child characteristics					
Psychotropic drug use in adolescence	7.2	10.5	8.5	11.6	7.5
Girls	48.6	34.0	28.0	55.4	41.2
Other significant malformation	2.1	3.2	11.6	13.1	12.7
SGA	2.5	2.4	6.6	4.6	4.8
Missing	0.2	0.0	0.0	0.6	0.9
Born in year					
1987	13.0	12.1	12.3	14.9	11.4
1988	13.9	10.1	11.9	11.1	15.4
1989	14.4	11.3	15.4	13.8	14.5
1990	15.1	15.8	15.1	14.4	15.4
1991	15.1	20.2	14.8	16.2	14.9
1992	14.7	16.2	15.1	15.3	18.4
1993	13.8	14.2	15.4	14.2	10.1
Maternal characteristics					
Smoking during pregnancy (cigarette/day)					
No	70.9	67.2	67.6	68.1	69.7
1–9	14.4	13.4	14.8	12.5	14.9
>9	8.7	13.8	10.7	13.1	8.3
Missing	6.0	5.7	6.9	6.3	7.0
Age at delivery (years)					
<20	2.5	2.8	3.1	2.2	3.5
20–24	22.6	21.1	25.2	22.5	21.1
25–29	38.3	42.1	39.3	36.0	40.4
30–34	25.5	25.1	19.2	24.5	25.4
35–39	9.4	7.7	10.1	13.5	8.3
>39	1.7	1.2	3.1	1.3	1.3
Hospitalised with a congenital malformation	1.9	2.0	4.1	3.3	3.1

All numbers are percentage unless otherwise indicated.
CL, cleft lip; CLP, cleft lip and palate; CPO, cleft palate only; OFC, orofacial cleft; SGA, small for gestational age.

Table 2 Psychotropic drug use in adolescence by being born with an OFC, distinguishing between CL, CLP, CPO and Unspecified OFC

	Unadjusted model			Adjusted model		
Adolescent characteristics	**OR**	**95% CI**		**OR**	**95% CI**	
OFC						
No OFC	1(Reference)			1(Reference)		
CL	1.51	1.00	2.27	1.63	1.08	2.46
CLP	1.19	0.80	1.77	1.21	0.81	1.80
CPO	1.69	1.30	2.19	1.54	1.18	2.01
Unspecified OFC	1.03	0.63	1.69	1.00	0.61	1.64
Girls vs boys				1.52	1.49	1.55
Other significant malformation (yes vs no)				1.48	1.40	1.57
SGA						
No				1(Reference)		
Yes				1.22	1.15	1.29
Missing				1.26	1.06	1.51
Born in year						
1987				2.52	2.43	2.63
1988				2.19	2.11	2.28
1989				2.00	1.92	2.09
1990				1.69	1.62	1.76
1991				1.40	1.34	1.46
1992				1.20	1.15	1.25
1993				1(Reference)		
Maternal characteristics						
Smoking during pregnancy (cigarette/day)						
No				1(Reference)		
1–9				1.37	1.34	1.41
>9				1.65	1.60	1.70
Missing				1.23	1.19	1.28
Age at delivery (years)						
<20				1(Reference)		
20–24				0.68	0.65	0.72
25–29				0.58	0.55	0.61
30–34				0.57	0.54	0.60
35–39				0.63	0.60	0.67
≥40				0.73	0.67	0.79
Hospitalised with a congenital malformation (yes vs no)				1.29	1.21	1.38

OR and 95% CI of psychotropic drug use are presented. Adjusted model includes all variables. In the adjusted model, we adjusted for sex, birth year, other significant malformations, SGA, maternal smoking, mother's age at delivery and mother congenital malformation.
CL, cleft lip; CLP, cleft lip and palate; CPO, cleft palate only; OFC, orofacial cleft; SGA, small for gestational age.

prescribed psychotropic medication was higher for adolescents born with a CL or a CPO. These results persisted after adjusting for confounders.

When the analysis was repeated using the variables "malformations" and "OSMs" to exclude cases with other congenital abnormalities and syndromes, results persisted and were only slightly altered regarding the ORs: after adjusting for potential confounders, having a CL (OR=1.60, 95% CI 1.05 to 2.45) or a CPO (OR=1.38, 95% CI 1.02 to 1.87) still increased the risk of psychotropic drug use, while results were still not conclusive regarding adolescents with a CLP (OR=1.13, 95% CI 0.72 to 1.76).

DISCUSSION

Our analyses, based on a large population database covering the whole of Sweden, indicate that children born with a CPO or CL type of OFC are at a higher risk of using psychotropic medication compared with unaffected children. Since use of psychotropic medication is a clear indicator of psychological health impairment, these findings suggest that those adolescents may be at a higher risk for impaired mental health. Therefore, our analyses confirm previous findings that children born with an OFC have more difficulties in psychosocial adjustment, compared with their peers without such malformations.[12–14] However, the closer follow-up of those children by medical providers may result in a higher rate of detection and medication treatment for psychiatric concerns, compared with detection rates in the general population.

Interestingly, our results indicate that this association is present in adolescents born with a CPO, consistent with other findings,[31] and in adolescents born with a CL, but not in adolescents born with a CLP. Previous studies investigating facial disfigurement suggested that

minor facial disfigurement can be more difficult to bear than more severe disfigurement,[55] highlighting the fact that, in essence, the perceived gravity of facial disfigurement is a subjective matter.[31 56] It is important to note that the CL group in particular has often been overlooked or mixed with the CLP group.[24 26 31 57 58] Our findings when using prescriptions of psychotropic drugs as proxy for poor psychological health, that CL increases the risk of poor psychological health during adolescence while CLP does not, may be regarded as further support to other research pointing to the subjective nature of experiencing and coping with facial cleft disfigurement of different kinds.

There are important clinical implications of these findings. Children born with a CL may need more attention from better informed healthcare staff, and closer monitoring over a long period of time, compared with current praxis. Also, parents to children born with a CL might need to receive more support and their concerns about their children's well-being may need to be addressed with equal gravity as parents' concerns when a child is born with other types of OFC. Specifically for children born with a CL, these issues have been insufficiently addressed in clinical praxis.

It may appear paradoxical that children born with a CLP do not seem to be more at risk of impaired psychological health during adolescence, considering that this type of OFC affects more parameters (ie, speech and facial aesthetics). However, the fact that children with a CLP receive more attention initially, from healthcare services and from their parents, who tend to spend considerable time with them at the hospital,[59] may act as a buffer against potential negative consequences of the CLP condition itself on children's psychological health. Indeed, children with a visible cleft (in Havstam's study, a CL or a CLP) have been found to be more emotionally resilient, compared with children with a non-visible cleft (CPO), possibly due to the increased efforts made by parents and other adults in the children's growing environment (healthcare professionals, teachers) to protect them from psychological threats.[60] These children may also have long-standing contacts with treating psychologists. Finally, stronger post-traumatic stress disorder symptoms in mothers who gave birth to a child with a cleft may be associated with stronger attachment bonds to the child later on,[61] so it is possible that mothers who gave birth to children with a CLP perhaps suffered a profound shock initially, but also developed strong bonds to their children later on. While it is clear that the origins of this apparently paradoxical resilience needs to be further investigated, our findings suggest that children born with different OFC types experience different degrees of psychosocial difficulties during their development, and therefore treating them as one clinical group when the focus is on psychosocial outcomes may lead to erroneous conclusions, possibly overestimating the impact of one type of OFC (eg, viewing CLP as a more severe condition as it involves problems in more parameters) and underestimating the impact of another type (eg, CL on the basis that it involves problems in fewer parameters). The importance of such systematic subgroup differences as the ones demonstrated in this study increases further because of the general subjective nature of experiencing and coping with a facial cleft, and the wide range of psychosocial consequences associated with these experiences.[10] Both aesthetical concerns and speech impairments may lead to severe psychosocial challenges such as peer rejection, social isolation or bullying,[62] but as treatment, training and psychosocial support during development must specifically address each of these two parameters separately, information that differentiates these parameters with respect to consequences is important. Also, the neuropsychological implications of the different OFC types may be different, which may also be reflected on psychological well-being.[63]

Our study has limitations. To begin with, while use of psychotropic medication is a clear indicator of poor psychological health, other possible treatments of poor mental health commonly used with children and adolescents, such as psychotherapeutic intervention, were not considered here as no information on such treatments was available in the databases. This may have resulted in an underestimation of poor mental health in all populations considered here. If, in addition, more OFC children have ongoing contacts with psychologists to whom they can turn when experiencing psychosocial problems, there is a risk that our analyses suffer differential information bias towards the one, particularly for the CLP group.

Moreover, it is known that children with OFC malformations, particularly those born with a CLP or a CPO, suffer from a number of other pathologies,[40] which are related both to OFCs and to an impaired psychological health in adolescence and might thus confound the association with use of psychotropic drugs. To avoid this potential confounding, we adjusted for the presence of OSMs as defined and recorded by the Swedish National Board of Health and Welfare through standardised criteria, including most syndromes known to be associated with OFCs.[44] Still, the OSM definition may be less exhaustive than more detailed follow-up studies.[64] While most associated congenital defects can be detected by a physical examination at delivery and are therefore included in our definition of OSMs, some malformations, such as congenital heart malformations, might only present clinical symptoms later after delivery. Therefore, we cannot exclude that some confounding disorder was missed, particularly given the low prevalence of OSMs found in our databases, although comparable to what has been reported elsewhere.[31 43] At the same time, although the percentage of children with birth defects is small at a population level, the fact that the population of children not born with an OFC was not restricted to children without other known birth defects may have resulted in residual confounding. Also, as all information used in this study was collected from registries using only the

ICD-9 and ICD-10 codes, and thus not confirmed by a geneticist in order to check the origin of the malformation as was carried out in other studies,[65] it cannot be excluded that some cases were misclassified.

Finally, our data included a small group of children for whom it was unclear what type of OFC they were born with (the "Unspecified OFC" group). This group did not appear to suffer adverse consequences in the psychosocial sphere (OR=1.00, 95% CI 0.61 to 1.64). It is possible that the OFC in those cases was of minor importance and therefore difficult to diagnose and not equally affecting the child.

CONCLUSION

Being born with an OFC malformation can increase the risk of impaired psychological health in adolescence. However, this increased risk seems to be present only in adolescents being born with a CL or a CPO and appears to be non-significant in adolescents born with a CLP. Hence, children with a CL and their parents may need to receive more attention than in current praxis, in order to assist a prevention of long-term adverse consequences of the initial condition. Our findings have a clear theoretical impact for further research; if adolescents born with a CL react differently to their condition, in terms of psychosocial adjustment, than those with a CLP, treating them as one group is likely to lead to misunderstandings concerning the needs of these patients and their families.

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