JARID Journal of Applied Research in Intellectual Disabilities
bild Published for the British Institute of Learning Disabilities
Journal of Applied Research in Intellectual Disabilities 2015

FASD Prevalence among Schoolchildren in Poland

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Accepted for publication *3 September 2015*

Background Prenatal Alcohol Exposure is a major cause of brain damage and developmental delay, known as Fetal Alcohol Spectrum Disorders (FASD) but in Poland is rarely diagnosed and the scale of problem is not known.
Methods An active case ascertainment approach was applied to estimate the prevalence of FASD among 7–9 years olds. Pre-screening was conducted in 113 randomly selected regular and special schools. In the screening phase participated 280 children (54% from the risk group, 60% boys). The entire number of eligible students (N = 2500) was taken as a denominator.
Results The prevalence of FASD is not lower than 2%, including 0.4% of Fetal Alcohol Syndrome.
Conclusions Neurodevelopmental disorders associated with PAE are a serious challenge for the public health system. Development of procedures and services to diagnose and to support individuals affected by PAE and their families is an urgent need in Poland.

Keywords: children, fetal alcohol spectrum disorders, fetal alcohol syndrome, Poland, prevalence

Introduction

Alcohol is one of the most common teratogens (e.g. Kumar 1982; Genetic Alliance 2010; Gilbert-Barness 2010). Exposure to alcohol *in utero* may result in miscarriage or cause significantly impaired development known as foetal alcohol spectrum disorder (FASD). FASD is a non-diagnostic umbrella term that covers several alcohol-related medical conditions including foetal alcohol syndrome (FAS), which is recognized in ICD-10; partial foetal alcohol syndrome (pFAS); and alcohol-related neurodevelopmental disorder (ARND) (e.g. Riley *et al.* 2011; Substance Abuse and Mental Health Services Administration 2014; Murawski *et al.* 2015). Neurobehavioural disorder associated with prenatal alcohol exposure (ND-PAE) is included in section III of the DSM-5 as a condition that requires further research.

All forms of FASD are characterized by central nervous system (CNS) dysfunction such as intellectual impairment and/or structural abnormalities, microcephaly, developmental delay and complex behaviour problems (Chudley *et al.* 2005). Individuals affected by prenatal exposure to ethanol often display characteristics such as attention deficits, hyperactivity, aggressiveness, poor judgment, and speech and language difficulties. Other clinical manifestations of FAS may include cardiac anomalies, urogenital defects, skeletal abnormalities, as well as visual and hearing deficits. Moreover, there is a remarkably high prevalence of epilepsy and seizures in the FASD population compared with controls (Bell *et al.* 2010). Congenital abnormalities are likely to interact with post-natal disadvantageous life conditions (also related to alcohol abuse in the family), including poor infant–caregiver attachment, neglect, disturbed sleep or eating patterns, and delayed development of language skills. Such life conditions have been suggested to contribute to more severe social deficits (Streissguth 1997; Kully-Martens *et al.* 2012).

Only a few EU countries have tried to assess FASD prevalence. In Croatia, the estimated prevalence of FAS among urban schoolchildren is more than six per 1000 live births, the prevalence of partial FAS is 34 per 1000, and the overall prevalence of FAS/pFAS is above 40 per 1000 (Petković & Barišić 2010). Estimates for rural populations are even higher: nearly 67 per 1000 schoolchildren may be suffering from FAS or

10.1111/jar.12219

pFAS (Petković & Barišić 2013). In Italy, estimated rates of FAS range between 4 and 12 per 1000, and pFAS rates are from 18 to 46 per 1000 (May *et al.* 2011). Some countries which have not conducted their own surveys estimate FASD prevalence on the basis of figures from the international literature. Using this approach, it was estimated that in Germany the prevalence of FAS ranges from 0.2 to 8.2 per 1000 births, which leads to an estimated 130–5400 babies with FAS born in Germany every year (Landgraf *et al.* 2013). All experts agree that most affected children are undiagnosed.

On average, Polish women consume 4.5 times less alcohol (PARPA 2008) and suffer from alcohol use disorders six times less frequently than men (Moskalewicz *et al.* 2012). But the highest rates of alcohol use disorders are observed among women of child-bearing age – among 30- to 39-year-olds, the rate is 5.7% (Moskalewicz *et al.* 2012). Considering that approximately one of four women in Poland drinks alcohol at least several times per month (Moskalewicz *et al.* 2012) and that most pregnancies are unplanned (Karmaus & Juul 1999; Mosher *et al.* 2012), the risk of having an alcohol-exposed pregnancy is rather high. In a national survey conducted in obstetric hospitals, 15% of women admitted that they had been drinking alcohol during pregnancy (Wojtyła & Biliński 2009). This rate is probably underestimated due to the negative social perception of alcohol use by pregnant women, which results in low reliability of self-reported data. Unfortunately, to date in Poland there have been no attempts to verify the prevalence of *in utero* alcohol exposure using biomarkers such as blood, urine, hair or meconium (Dębski *et al.* 2014). Neither has the prevalence of FASD been assessed.

Therefore, the State Agency for prevention of alcohol-related problems (PARPA) undertook a study to give better insight into the problems related to alcohol use in pregnancy in Poland. There were three main goals to the study: (i) to estimate the prevalence of FASD among children (7–9 years old) using an active case ascertainment approach; (ii) to investigate the patterns of alcohol consumption during pregnancy; and (iii) to assess the usefulness of various tools for FASD diagnosis and the provision of professional therapy and support for parents and children with recognized FASD. The motivation for this project came from the 'World Health Organization', which initiated an International Collaborative Research Project on foetal alcohol spectrum disorder (FASD) in east Europe in 2011.

Materials and Methods

Sampling

The study was approved by the Bioethics Committee of the Institute of Psychiatry and Neurology, Resolution 3/2012. The research was conducted in four administrative regions from south-east Poland. Two main reasons for selecting this region were as follows:

1. Significant cross – voivodeship difference (from 8% to 19%) in the prevalence of prenatal ethanol exposure, as reported by mothers (Wojtyła & Biliński 2009).
2. Establishment (in 2012) of the Centre for Complete FASD Diagnosis and Treatment in Cracow the biggest town in the selected area. This created the opportunity for further clinical diagnosis and professional medical care for children who screened positive.

The selected area provides a good representation of the Polish population in terms of the economic situation: one voivodeship is highly urbanized and rates second in Poland in terms of the average salary. In two others, the urbanization rate is very low and of these two, in one of them the average salary is at the last but one place in Poland. Moreover, unemployment rates in two of the regions are relatively low (<10% in 2011), while the other two have a high rate (>14%).

As nearly one-third of the Polish population (11 370 000 people) lives in the areas covered by this study, the present authors chose, from each of the voivodeships, one district (county) providing special educational/custodial facilities, such as child care centres, orphanages or schools/classes for children with mental retardation. The authorities of selected districts agreed to participate in the study and cooperated in contacting schools and finding local research assistants.

According to Polish legislation, all children, despite their health condition, have to attend or be enrolled in a school. Therefore, databases of the Educational Information System (SIO) covering all Polish schools were used for random allocation of regular and special school classes to be included in the study. In total, 155 classes from 113 schools, with an estimated number of 2500 students, were selected. Classes from rural schools accounted for 25% of the sample, 55% were from schools located in a big city, and the remaining 30% were from smaller towns. Students enrolled in special education constituted 11% of the sample.

Recruitment procedures

After obtaining consent for the school's participation from the local authorities, local project coordinators were trained in the recruitment procedure. Each of them received the list of selected schools or classes, instructions for communication with headmasters, teachers, parents and students, as well as consent forms for parents and children. The standardized recruitment procedure involved a meeting with the school headmaster, who would facilitate the coordinator's meeting with parents during parents' evening at school to provide them with information about the project, ask for participation, and obtain their consents. Local coordinators were asked to systematically report the recruitment process to PARPA. Their second task concerned supporting PARPA in recruiting local research assistants and organizing their training.

Inclusion criteria

Students were eligible to participate if they were from 7 to 9 years old, attending one of the selected classes in grade I, II or III, whose parents or caregivers would sign the written consent for the child's and their own participation in the entire study. Consent forms from eligible children were also collected. Students with a diagnosis of any genetic disease were excluded from the study.

Measures

The data collection procedure was divided into two phases:

Pre-screening

Pre-screening was conducted in schools, by trained pedagogues or psychologists and social assistants or nurses. The latter two measured the children's height, weight and head circumference. School pedagogues or psychologists collected data from parents and teachers on the child's behavioural disorders and/or school problems, using neurobehavioural screening test – short, 10-item scale for parents (Nash *et al.* 2006) and a newly developed form to evaluate student behaviour. This form was especially designed for this study, and has not previously been validated. It asks teachers to assess each student participating in the study on four dimensions: childish versus mature functioning; low versus high academic achievement; good versus poor relationships with peers and adherence to versus breaking school rules.

A child was invited to the next phase of the project if at least one growth parameter was ≤10 percentile and/or the child had significant behavioural or academic problems. Children not meeting these criteria but matching the experimental group in terms of age and gender were invited to the next phase as a control group.

Screening

Data collection. In this phase, data were collected independently by three research assistants: a practitioner or nurse; a psychologist or pedagogue and a neuropsychologist or psychologist (involvement of a particular specialist, for example nurse or general practitioner was determined by local human resources). Each of these specialists had unique responsibilities in the project. The general practitioner or nurse was responsible for the basic medical evaluation of the child and the assessment of three cardinal dysmorphologies: short palpebral fissures (measured with a ruler and calliper, and interpreted on the basis of Thomas *et al.* 1987), a flat philtrum and a thin vermilion border of the upper lip (assessed on the 5-point pictorial scale of Astley & Clarren 2001). The psychologist or pedagogue collected data from parent(s)/caregiver(s) on: child behavioural problems, using the Child Behaviour Checklist (CBCL in Polish adaptation by Wolanczyk 2001) and maternal alcohol history during pregnancy. The primary method was using a specially designed questionnaire to interview biological mothers about the family situation prior to and during pregnancy, the course of the pregnancy, lifestyle during pregnancy, including factors such as infections, nutrition, stress and use of medicines, alcohol or tobacco. As a secondary method, data were collected from foster or adoptive parents or from social workers. A psychologist/neuropsychologist assessed CNS functioning. According to the Canadian Guidelines for Diagnosis (Chudley *et al.* 2005), applied in this study, evidence of impairment in at least three domains is required for FASD diagnosis. These domains concern structural brain changes (here indicated by head circumference ≤10 percentile) and several CNS dysfunctions: neurological (motor/verbal), intellectual, communication, academic, memory, abstract thinking, attention, adaptive behaviours and social skills (see Table 2 for the list of domains assessed together with the information on the measurement tools). Also, in

accordance with diagnostic guidelines (Chudley *et al.* 2005), psychologists were instructed to follow some general rules of proper testing, that is to use several sources of information; to assess each function independently; to rely, as far as possible, on standardized measurement tools (Delis *et al.* 2001; Matczak *et al.* 2008; Jaworowska *et al.* 2009; Beery & Beery 2010) and if these were not available – to conduct a clinical assessment.

Prior to data collection, nurses/practitioners participated in a 2-day training course on dysmorphology assessment. Trainings for psychologists lasted 4 days and covered neuropsychological and behavioural measures, as well as the training on how to interview a biological mother.

Diagnosis. Diagnosis of FAS, pFAS and ARND was made in accordance with Canadian Guidelines (Chudley *et al.* 2005; Table 1) and given by diagnostic teams consisting of those professionals who had examined the child and collected data from their parent(s)/caregivers. In interpreting the results of neuropsychological assessment, they were instructed to consider a domain as 'impaired' when the score on a standardized measure was two standard deviations or more below the mean.

The coordinating team further verified the accuracy of converting row tests results into standardized measures; checked for agreement with diagnostic criteria (Chudley *et al.* 2005); and looked for missing or incongruent data. All uncertainties and missing test results (unless it was clearly reported that a child was not able to do the test) were interpreted in the child's favour. Due to the lack of D-Kefs and VMI standardized scores for 7-year-olds, these test results were not taken into account for the youngest children. It was also assumed that all missing data on prenatal alcohol exposure would be interpreted as no exposure, but any alcohol use during pregnancy reported by a mother was noted as a risk factor.

The study group

Of the initial sample of 2500 eligible 7- to 9-year-old students, 83% did not enter the study due to refusal of

Table I Diagnostic criteria for FAS, pFAS and ARND (Chudley *et al.* 2005)

	FAS	*pFAS*	*ARND*
Growth	a. Birthweight or birth length ≤10th percentile for gestational age; or b. height or weight ≤10th percentile for age; or c. disproportionately low weight-to-height ratio (=10th percentile)	–	–
Facial features	Simultaneous presentation of all 3 of the following: a. short palpebral fissure length (≤2 SD below the mean); b. smooth or flattened philtrum (rank 4 or 5 on the lip-philtrum guide); c. thin upper lip (rank 4 or 5 on the lip-philtrum guide)	Simultaneous presentation of two of the facial features characteristic for FAS	–
CNS	Evidence of impairment in 3+ of the following CNS domains: hard and soft neurologic signs; brain structure; cognition; communication; academic achievement; memory; executive functioning and abstract reasoning; attention deficit/hyperactivity; adaptive behaviour, social skills, social communication	Evidence of impairment in 3+ of the CNS domains (as described for FAS)	Evidence of impairment in 3+ of the CNS domains (as described for FAS)
Maternal alcohol exposure	Confirmed (or unconfirmed)	Confirmed	Confirmed

school authorities to contact the students' parents or refusals by their parents. Among the 409 students participating in the pre-screening phase, growth deficiency was recognized in 29% and behavioural or school disorders in 11% (by teachers) and 21% (by parents). Therefore, 169 students were classified as belonging to a risk group, and 156 controls were invited to participate in the screening phase of the study. Finally, the screening was completed for 280 children. Four per cent (11 students) were excluded from statistical analysis due to age (10+); other diagnosis (Down syndrome, Asperger syndrome); or allocation beyond the sampling frame (their caregivers took the project as an opportunity to receive a diagnosis, which otherwise were not available).

The low participation rate makes it impossible to assess the prevalence of FASD in the general population. But assuming that all eligible children with FASD took part in the pre-screening phase, the present authors can estimate the lowest border of FASD prevalence in the population. Therefore, the entire number of eligible students (2500) was taken as a denominator in the estimation of FASD rates.

Sample characteristics

Among participants of the screening phase of the project, 54% were recognized in the pre-screening phase as being at risk for FASD. Boys were in the majority in the sample (60%). Most of the children were 8 (37%) or 9 (37%) years old, while 26% were younger (7 years of age).

Most of the children were born when their mothers were between 21 and 35 years of age (83%) and married (80%). At the time of screening, 71% lived with both (probably – biological) parents. In 2% of cases, children lived in re-constructed families (mother + stepfather), 2% in foster families created by their relatives, 3% in foster families with no blood relationship and in two cases (1%) adoption was declared. Eighteen per cent of the children lived with the biological mother only (single-parent families), and three children (1% of the sample) lived in various institutions (orphanage; halfway house).

Results

FASD prevalence

Final verification of diagnosis by the coordinating team indicated FAS in 10 children, pFAS in 20 and ARND in 20. Taking as a denominator the total number of eligible children, the prevalence of foetal alcohol spectrum disorders (FASD) in Poland may be assessed as 20 per 1000, including FAS, four per 1000; pFAS, eight per 1000; and ARND, eight per 1000.

Detailed results of examination of the children are presented in Table 2. According to the diagnostic criteria, growth deficits and three facial dysmorphologies were recognized in 100% of FAS cases; and prenatal alcohol exposure was present in 100% of pFAS and ARND cases. Furthermore, CNS dysfunctions in at least three areas were recognized in all FASD cases. All but one brain function (memory deficits) significantly differed among no-FASD and FASD groups (Table 2).

In 22 per 1000 children, significant CNS dysfunctions (fulfilling FASD diagnostic criteria) were observed. However, their aetiology remains unknown, as other FASD diagnostic criteria were not met.

Socio-demographic characteristics of FASD and no-FASD group

Higher rates of FASD were observed among children 7–9 years old. The most significant socio-demographic characteristics of children with a FASD were not living with biological parent(s); born from a second or later pregnancy; mothers with lower education and not married during the pregnancy (Table 3).

Prenatal alcohol exposure

In the total sample, alcohol use during pregnancy was declared by more than 35.7% of biological mothers (and/or reported by their relatives or other people), including one-third (32.9%) of mothers of children classified as no-FASD. However, self-reported data do not yield a reliable, quantitative description of the amounts or frequency of alcohol use during pregnancy based on self-report by the mothers of children with FASD, several observations can be made. First mothers from the no-FASD group who declared drinking alcohol when pregnant most often declared 'sporadic' or 'occasional' use of very limited amounts ('a sip', 'half of a glass of wine') or gave precise answers such as drinking no more than four times during pregnancy, up to two standard drinks. However, there were five reports suggesting more significant alcohol exposure: 'drinking three times per week'; '4–5 beers from time to time in early pregnancy'; 'having a drink 6–7 times per month'; 'being drunk four times during pregnancy'; 'having beer or wine twice a month and being drunk

Table 2 Health problems recognized among 7- to 9-year-old children participating in the screening phase of the project ($N = 269$)

Health problems (measures/tests used to assess the domain)[1]	*No FASD* *N (%)*	*ARND* *N (%)*	*pFAS* *N (%)*	*FAS* *N (%)*
Growth deficiency (weight and/or height and/or BMI ≤ 10 percentile)*	36 (17.2%)	7 (38.9%)	3 (15.0%)	10 (100.0%)
Facial dysmorphologies (short palpebral fissures, flat philtrum, thin upper lip), 2 of 3	20 (9.3%)	0 (0.0%)	11 (55.0%)	0 (0.0%)
3 cardinal facial dysmorphologies*	10 (4.7%)	0 (0.0%)	9 (45.0%)	10 (100.0%)
CNS dysfunctions in 3 or more areas*, including	55 (25.1%)	20 (100.0%)	20 (100.0%)	10 (100.0%)
Structural (head circumference ≤10 percentile)*	43 (19.6%)	8 (40.0%)	9 (45.0%)	7 (70.0%)
Neurological signs (VMI; Trail Making Test Task 5)***	119 (55.1%)	14 (70.0%)	17 (89.5%)	5 (55.6%)
Attention deficits (Trail Making Test Task 1; CBCL – attention deficits scale)*	21 (9.6%)	5 (26.3%)	10 (50.0%)	4 (40.0%)
Academic problems (CBCL – parental report)*	31 (14.3%)	12 (60.0%)	12 (63.2%)	8 (80.0%)
Cognitive and executive functions deficits (IQ – Leiter test; Trail Making Test Task 4 and contrast scales)***	65 (31.7%)	6 (31.6%)	5 (38.5%)	7 (77.8%)
Abstract reasoning (WISC-R – similarities; CBCL – reasoning deficits)*	7 (3.2%)	5 (26.3%)	5 (25.0%)	3 (33.3%)
Memory deficits (WISC-R memory scale)	7 (3.2%)	0 (0.0%)	2 (10.0%)	1 (10.0%)
Adaptive functions deficits (observation; CBCL – problem, aggressive, antisocial behaviours; withdrawal)*	27 (12.1%)	7 (41.2%)	10 (52.6%)	4 (44.4%)
Communication deficits (WISC-R – verbal scales; verbal fluency test)**	94 (44.5%)	14 (77.8%)	14 (70.0%)	9 (90.0%)

[1]Besides using standardized measures mentioned below, psychologists were asked to provide clinical/qualitative assessment of a child functioning in each of the domains.
*$P < 0.001$; **$P = 0.001$; ***$P = 0.05$.

once'. In all these cases, diagnostic teams recognized FASD while the coordinating team did not.

1. Six of ten mothers of children with FAS diagnosis declared regular ('every weekend'), frequent ('beer and wine several times per week') or daily drinking of alcohol across the entire pregnancy.
2. The majority of mothers (11 of 20) of children with the diagnosis of pFAS reported moderate alcohol use during pregnancy (ranging from 'only once and no more than two drinks' to 'a few times around two drinks') or did not give any details. Some others declared drinking more: for example, 'two times per week, half a bottle of wine'; 'heavy drunkenness, daily'. One mother reported, very precisely, having had 'three drinks in the fifth month of pregnancy'.
3. Nearly one in two mothers of children with ARND declared drinking alcohol before learning about the pregnancy or 'occasionally having' a small amount of

Table 3 FASD and no-FASD group socio-demographic differences

Participants' characteristics	*no-FASD (n = 219)*	*FASD (n = 50)*	*P*
Gender			
Male	83%	17%	n.s.
Female	80%	20%	
Age			
7	71%	29%	<0.01
8	92%	8%	
9	78%	22%	
Child's family			
Both parents	87%	13%	<0.001
Mother only	74%	25%	
Foster/adoptive family/ institution	45%	55%	
Mothers age in pregnancy			
<21	78%	22%	n.s.
21–35	84%	16%	
>35	70%	30%	
Mother status when pregnant			
Married	87%	14%	<0.01
Not married	69%	31%	
Mothers education			
Lower	70%	30%	<0.001
Secondary	88%	12%	
Higher	91%	9%	
Childbirth			
First	90%	10%	<0.01
Second	75%	25%	
Third +	76%	24%	

alcohol. Two others admitted drinking several times per week, up to two drinks, across the pregnancy. However, most mothers did not provide any details.

Inconsistency of diagnosis

The coordinator's verification of diagnosis formulated by diagnostic teams indicated differences in 36 cases. In three cases, coordinators identified ARND or pFAS although diagnostic teams did not recognize FASD, but much more common was the situation when diagnostic teams recognized FASD while the coordinator did not. All reasons for inconsistent diagnosis are presented in Table 4.

Discussion

Our study provides the first estimates of FASD prevalence in the population of Polish schoolchildren.

Table 4 Inconsistent diagnosis set by diagnostic teams and project coordinators

Diagnosis			
Coordinator	*Diagnostic team*	*Reasons of inconsistency – According to coordinators, the diagnostic team …*	*Number of cases*
ARND	no-FASD	… disregarded structural brain changes and attention deficits reported by parents (in one of these two cases)	2
pFAS	no-FASD	… recognized all pFAS features but formulated no-FASD diagnosis	1
no-FASD	pFAS, ARND	… recognized less than 3 CNS dysfunctions (as coordinators did) but still diagnosed FASD	5
no-FASD	FAS, pFAS, ARND	… recognized impaired 3 CNS functions in 7-year-olds, without having standardized scores for this age group and without reporting clinical assessment	9
no-FASD	pFAS, ARND	… recognized CNS dysfunction when a domain (or domains) were 1 standard deviation below the mean (not 2 SDs, as assumed)	9
no-FASD	FAS, pFAS	… ignored lack of evidence of prenatal alcohol exposure in cases not meeting other FAS criteria (growth deficits and/ or 3 key facial dysmorphologies)	3
pFAS	FAS	… ignored lack of growth deficits	4
FAS, ARND	pFAS	… recognized FAS or ARND features but formulated pFAS diagnosis	2
ARND	pFAS	… ignored lack of evidence for at least 2 key facial dysmorphologies	1

Never before has a similar study been undertaken in Poland, due to several reasons which will be discussed below. The results of our population survey indicating FASD prevalence not lower than 2% are similar to international estimates based on community studies which show that that FASD might be as prevalent as 2–5% of the population (May *et al.* 2009, 2014). Unfortunately, very low sample participation in Poland makes it impossible to estimate the range of FASD prevalence rates using various methods that were feasible in other studies. In our study, the only possible approach was to use the most conservative, cautious denominator, the entire eligible population and to assess the lowest border of the range of FASD. It is evident that in our study not all FASD positive cases were revealed, but low sample participation does not allow a more reliable estimation.

Certainly, in future studies, the procedure of obtaining parental consent for participation in the epidemiological study will have to be modified. Probably instead of asking, from the very beginning, for the consent to participate in all three phases of the project (pre-screening, screening and verification of the screening), the first contact with parents should focus on the pre-screening phase only. Another solution might be inclusion of the FASD prevalence study into a broader health survey.

Besides low participation rate, a serious limitation of our study concerns utilization of measures new for our psychologists and practitioners. First of all, medical doctors and nurses felt uneasy and uncertain when measuring the length of palpebral fissures or assessing philtrum and vermilion border of the upper lip on the 5-picture scale. They also underlined the fact that there are no Polish (or, at least European) norms to assess facial dysmorphologies.

Secondly, Polish psychologists are not familiar with standardized measures of CNS dysfunctions, for example in the area of executive functions, cognitive flexibility, visual-motor integration and verbal fluency. Therefore, experimental utilization of the CBCL, Beery VMI, Trail Making Test, Verbal Fluency Test or Leiter Test was very challenging for some of them. Furthermore, there are no Polish norms for the Beery VMI and D-KEFS. Moreover, only a few psychologists provided information on clinical assessment of CNS dysfunctions to fill the gaps in standardized measures.

Thirdly, the idea of working in diagnostic teams is new for Polish specialists and generally perceived as inadequate in our healthcare system. Therefore, instead of in-depth case-conferences, more technical meetings to fulfil project's requirement took place.

Being aware of all these challenges and that the Canadian Guidelines for Diagnosis of FASD (Chudley *et al.* 2005) are new for all practitioners, coordinators decided to double-check all diagnoses. Revealed inconsistencies suggest that Polish specialists tend to over-diagnose FASD. However, the present authors cannot determine which diagnoses are more credible: those of the coordinators, who strictly followed the Canadian Guidelines or those formulated by diagnostic teams who relied more on the practitioners clinical experiences. The validity of both diagnostic approaches will be verified in the final, ongoing phase of the project focusing on structural brain changes (MRI) and in-depth measures of selected CNS functions (CANTAB).

The weakest element of our data set concerns the information on alcohol consumption during pregnancy by biological mothers. They talked about it only hesitantly, either because they did not remember or because they did not want to put themselves in a bad light. Verification of their life stories by other family member or acquaintances was possible in only a few cases. Therefore, our information on prenatal alcohol exposure is very limited, unreliable and not sufficient for detailed quantitative analysis.

This study has shown very clearly, that even with a very conservative analysis of our results, FASD must be seen as a serious problem in Poland. FASD is much more prevalent than previously suspected, and public health specialists need to be aware of FASD. Our estimates of FASD prevalence in the general population of Polish schoolchildren provide a strong argument for developing procedures and services to prevent alcohol use by pregnant women and to support individuals affected by *in utero* alcohol exposure and their families. The current needs include the following:

1. Development of unified FAS, pFAS and ARND diagnostic standards to be used across Poland.
2. Training of interdisciplinary diagnostic teams.
3. Development of reliable measurement tools for the assessment of various domains of CNS functioning and standardization of these tools in Poland.
4. A systematic approach to support families with children affected by prenatal alcohol exposure.
5. Training of professionals to enhance their skills in preventing alcohol use by pregnant women.
6. Improved care of and support for pregnant women with alcohol-related problems.
7. Further research enabling better understanding of the neurodevelopmental consequences of prenatal

alcohol exposure and facilitating provision of effective interventions to improve the quality of life of affected individuals.

Acknowledgements

Authors would like to thank Jolanta Terlikowska for the management of the project, Teresa Jadczak Szumiło and Krzysztof Liszcz for the support of trainings of the research staff and Diane Black from EUFASD for the English edition of the manuscript. The project was funded by the Ministry of Health (Warsaw, Poland).

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