International Clearinghouse for Birth Defects
Surveillance and Research

48th Annual Meeting of the International Clearinghouse for Birth Defects Surveillance and Research (ICBDSR)

September 18th – 21st, 2022
Bologna, Italy

Relais Bellaria Hotel & Congressi

Organized by
ICBDSR
Emilia Romagna Registry on Congenital Malformations (IMER)
Alma Mater University of Bologna
Emilia Romagna Region Health Service

International Clearinghouse for Birth Defects
Surveillance and Research

Annual Meeting Planning Committee
(in alphabetical order)

Lorenzo D. Botto
Neville Calleja
Guido Cocchi
Miriam Gatt
Boris Groisman
Anke Rißmann
Mary Ann Thomas
Simonetta Zezza

ICBDSR website: www.icbdsr.org
Annual meeting pre-recorded presentations: www.icbdsrtraining.org

Acknowledgments

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The ICBDSR is a Promoting Organization of

www.worldbirthdefectsday.org

PROGRAM

	Sunday, September 18th, 2022 - Bologna, Relais Bellaria Hotel
15:00-17:30	**Executive Committee Meeting** *(Executive Committee members and ICBD staff only)*
17:30-18:30	**World Birth Defects Day-WBDD meeting** *(meeting room "Girasole")*
18:30-19:30	**Registrations** ICBDSR Annual Meeting
19:30	**Welcome Cocktail** *(offered by ICBDSR)*

	Monday, September 19th, 2022- Bologna, Hotel Relais Bellaria **Meeting Room Ginestra**
9:00 - 9:15	**Welcome**
9:15 - 9:30	**ICBDSR Executive Committee Talk** *Boris Groisman, ICBDSR Chair and Lorenzo D. Botto, ICBD Director*
9:30-10:10	J**. David Erickson Lecture**: **Public Health Response to Birth Defect Emergencies** *Cynthia Moore, Consultant, Birth Defect Center, US Centers for Disease Control and Prevention. Atlanta, GA, USA*
10:10-10:15	**ICBDSR Distinguished Service Award**
10:15-10:30	**Role of NGOs in Birth Defects Advocacy, Prevention and Care** *Salimah Walani, Global Policy & Advocacy Advisor, MiracleFeet, USA*
10:30-10:45	**EUROCAT Updates** *David Tucker, President EUROCAT Association*
10:45-11:00	**NBDPN Updates** *Paul A. Romitti, University of Iowa, USA*
11:00-11:15	*Coffee break*
11:15-11:30	**EUROlinkCAT – A European Linked Cohort of children with Congenital Anomalies** *Joan Morris, Principal Investigator of EUROlinkCAT, St George's, University of London, UK*
11:30 - 13:15	**Session I – Oral Presentations** **Moderators:** Lavinia Schuler-Faccini, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Brazil Florence Rouget, Brittany Registry of Congenital Malformations, Rennes University Hospital, France **Birth defect surveillance and descriptive epidemiology I** Pilot-Project based on National Birth Registration System: Surveillance and Care for Congenital Anomalies in Rio Grande do Sul State, Brazil *Simone Karam* Seven Years' Experience of Birth Defect Surveillance in Bangladesh *Mohammad Abdul Mannan* Detection rates of a national fetal anomaly screening programme: a national cohort study *Sarah Stevens* Birth defect surveillance and descriptive epidemiology in Hungary MSMRI and MALFOVAR Registers *Tidhar Steiner*

	Creation of a congenital anomalies registry in south-west French area (ATENA). Systematic environmental exposures collection and automatisation of the collection *Julie Thomas-Chabaneix* Shiny application for monitoring congenital anomalies in Rio Grande do Sul, South of Brazil *Márcia Barbian* Algorithms for use of health care databases to improve the surveillance of congenital anomalies *Amanda J. Neville*
13:15-14:15	*Lunch*
14:15 - 16:00	**Session II – Oral Presentations** **Moderators:** Cecilia Mellado, School of Medicine, Pontificia Universidad Catolica de Chile Sarah Stevens, National Congenital Anomaly and Rare Disease Registration Service (NCRDRS), NHS Digital, UK **Birth defect surveillance and descriptive epidemiology II** Neural tube defects in the Czech Republic: incidence, prenatal diagnostics and sex ratio *Antonin Šípek, Jr* Prevalence of CHD in Emilia Romagna, Italy *Elisa Ballardini* Congenital Diaphragmatic Hernia: What can the National Congenital Anomaly and Rare Disease Registration Service (NCARDRS) tell us? *Kathryn Johnson* A multi-program analysis of Cleft Lip with Cleft Palate prevalence and mortality using data from 22 International Clearinghouse for Birth Defects Surveillance and Research programs, 1974-2014 *Niall J. McGoldrick* Epidemiologic characteristics of patients with microtia in Cali and Bogotá during 2020 and 2021 *Maria Camila León Sanabria* Isolated Fetal Ascites in Wales 1998-2019 *Odai Yaghi* Covid vaccine and birth defects -CDC's v-safe pregnancy registry data *Jennita Reefhuis*
16:00-16:15	*Coffee break*
16:15-16:45	**Poster session** *(meeting room "Girasole")*

16:45 – 18:30	**Session III – Oral Presentations** **Moderators:** Adriana Benavides Lara, Centre of Congenital Disease Registry (CREC), Costa Rica Wendy N. Nembhard, University of Arkansas for Medical Sciences, Little Rock, USA **Risk and protective factors for birth defects** How Birth Defect Surveillance Systems are Informing the Impact of Food Fortification with Folic Acid on the Birth Prevalence of Neural Tube Defects *Helena Pachón* Neural Tube Defects and Folic Acid Effects: Clarifying and Expanding the Phenotype *Cara T. Mai* Zika Virus-associated birth defects among live births in Costa Rica 2016-2018 *Adriana Benavides-Lara* A novel investigation of seropositivity to chlamydia among women prenatally diagnosed with and without gastroschisis *Marcia L. Feldkamp* Neighborhood Deprivation During Pregnancy and Risk of Early and Late Stillbirths *Wendy N. Nembhard* Hypothyroidism in patients with Down Syndrome: prevalence and association with congenital heart defects *Francesca Gorini* Neonates infected and/or born to mothers with SARS-CoV-2 during pregnancy or peripartum, hospitalized in French level 3 neonatal intensive care units (NICUs): a reactive national surveillance system *Julie Boudet-Berquier*
19:30	*Dinner at Relais Bellaria Hotel (included in the registration fee)*

	Tuesday, September 20th, 2022
	Congress on "Congenital Heart Defects: From Prenatal Diagnosis to Adulthood"
	Conference Hall "Sala 20 Maggio 2012"- Viale della Fiera 8, Bologna
08:15	*Bus departure from Relais Bellaria Hotel to the Emilia Romagna Region Conference Hall*
9:00 - 9:20	**Opening Ceremony**
	Maurizia Rolli, Emilia Romagna Region, Italy
	Marco Seri, Bologna, Italy
	Stefano Volpato, Ferrara, Italy
	Boris Groisman, Buenos Aires , Argentina
9:20-9:30	**Introduction** **Chair: Marco Seri**, Bologna, Italy Why my child? Can anything be done? **Guido Cocchi,** *Bologna, Italy*
9:30 - 10:00	**Keynote Lecture** **Chair: Marco Seri**, Bologna, Italy Congenital heart defects: a lifespan and population perspective. **Lorenzo D. Botto**, *Salt Lake City, USA*
10:00-11:00	**The Prenatal Diagnosis: impact and outcome**
	Chair: Luigi Tommaso Corvaglia, *Bologna, Italy*
	The prenatal diagnosis of Congenital Heart Disease: Recommendations for prenatal screening. **Gianluigi Pilu**, *Bologna, Italy*
	The prenatal diagnosis of Congenital Heart Disease: Impact and outcome. **Daniela Prandstraller**, *AUSL Romagna, Italy*
	Genetics of heart defects in prenatal diagnosis. **Claudio Graziano**, *AUSL Romagna, Italy*
	Prenatal counseling and perinatal assistance **Chiara Locatelli**, *Bologna, Italy*
11:00-11:30	Discussion
11:30-11:45	*Break*
11:45 - 12:45	**Diagnosis and therapeutic approaches to the newborn with Congenital Heart Defects**
	Chair: Gaetano Domenico Gargiulo, Bologna, Italy
	Cardiogenetic approach in neonates with Congenital Heart Defects. Does it improve clinical outcome? **Anwar Baban,** *Rome, Italy*
	Management of neonates with Congenital Heart Defects: challenging condition for paediatric cardiologist **Luca Ragni**, *Bologna, Italy*
	Surgical treatment of neonates with Congenital Heart Defects: single gateway to the future **Emanuela Angeli,** *Bologna, Italy*
12:45 - 13:15	Discussion
13:15-14:15	*Light Lunch*

14:15-15:30	**Follow-up, Surveillance, and Outcome**
	Chair: Andrea Donti, Bologna, Italy
	Congenital Heart Disease: Left and Right sided Heart Obstruction. **Nadia Assanta,** *Massa Carrara, Italy*
	Congenital Disease: Single Ventricular Physiology **Giulio Calcagni,** *Rome, Italy*
	Evaluation and management of the child and adolescent with heart disease. **Giovanni Battista Calabri**, *Florence, Italy*
	Surgical outcome and mortality in children with congenital heart disease across Europe. **Mads Damkjaer,** *Kolding, Denmark*
15:30-16:00	Discussion
16:00-16:30	*Break*
16:30-17:30	**Heart Defects and Adulthood**
	Chair: Marco Bonvicini, Bologna, Italy
	The lifelong journey of adults with congenital heart disease. **Gabriele Egedy Assenza,** *Bologna, Italy*
	Living with a congenital heart disease: psychological aspects in adulthood. **Enrica Longo,** *Bologna, Italy*
	Little Big Hearts: a fantastic reality inside the Hospital **Patrizia Romualdi**, *Bologna, Italy*
	My (extra)ordinary life: from surgical operations to the transplant **Emanuele Galli**, *Bologna, Italy*
17:30-18:00	Discussion
18:30	*Bus departure from Emilia Romagna Region Conference Hall to Relais Bellaria Hotel*
20:30	*Social Dinner at Relais Bellaria Hotel offered by Emilia Romagna Registry (IMER)*

	Wednesday, September 21st, 2022 - Bologna, Hotel Relais Bellaria **Meeting Room Ginestra**
9:00 - 11:30	**ICBDSR Annual Business Meeting** *(ICBDSR members only)*
11:30 - 11:45	*Coffee break*
11:45 - 12:45	**Session IV – Oral Presentations, Virtual** (pre-recorded presentations) Survival of Infants and Children Born with Severe Microcephaly, Texas, 1999-2015 *Lisa K. Marengo* Developing a prediction model for risk of preterm birth among infants with orofacial cleft defects in Texas *A.J. Agopian* Early pregnancy outcomes and congenital anomalies following COVID-19 vaccination: a whole population, matched cohort study using Scottish national health records *Rachael Wood* Accuracy of congenital anomaly coding on live birth children recorded in health care databases *Hermien E.K. de Walle* Congenital cardiac anomalies among babies (live born /stillborn) at birth in a Tertiary care hospital of Northern India over a period of seven years *Neelam Aggarwal*
12:45 - 13:15	**ICBDSR Collaborative Projects Session** and **ICBDSR Report 2023**
13:15 - 14:15	*Lunch*
15:00	*Departure from hotel Bellaria to Bologna city center (by public transport)*
16:00 - 19:30	*Tour in Bologna (2.30 hrs) with aperitif (optional, personal payment)*
	Departures

Posters – in person presentation

(Alphabetical order by corresponding author's last name)

The posters will be shown on Monday 19th September
from 16:15 to 16:45 (Poster Session - meeting room "Girasole")

Reduction of infant mortality from congenital heart defects in Costa Rica
A Benavides-Lara, MP Barboza-Arguello, O Arguedas-Arguedas, J Faerron-Angel, E da Cruz

Survival, hospitalisation and orphan drug use of patients with rare diseases: a multi-database population-based cohort approach
A Coi, M Santoro, S Baldacci, F Gorini, L Mezzasalma, A Pierini

The Global Status on Folic Acid-Preventable Spina Bifida and Anencephaly in the Year 2020: 30-Year Anniversary of Gaining Knowledge about Folic Acid's Prevention Potential for Neural Tube Defects
V Kancherla, K Wagh, P Priyadarshini, H Pachón, GP Oakley, Jr.

Current activities of the JRC-EUROCAT Central Registry
A Kinsner-Ovaskainen, A Perraud, S Martin

Analysis of birth defects: comparison of reported cases of Venezuelan migrant and Colombian mothers in the cities of Bogotà D.C. and Cali during 2017-2021
AM Urueña, A Carreño, MC León, K Sarmiento, P Hurtado, I Zarante

Analysis of prevalence and follow-up of children with congenital heart disease in Bogotà D.C. from June 2020 to December 2021
MC León, AM Urueña, A Alonso, J Guaca, K Sarmiento, A Carreño, JR Correa, I Zarante

National prevalence of neural tube defects in Chile
C Mellado, R Pardo, M Hernandez

Prevalence and Clustering of Congenital Heart Defects among Boys with Hypospadias
Patel J 12, Richard MA 3, Benjamin RH 4, Bircan E 2, Canon SJ 56, Marengo LK 7, Canfield MA 7, Agopian *J Patel, MA Richard, RH Benjamin, E Bircan, SJ Canon, LK Marengo, MA Canfield, AJ Agopian, PJ Lupo, WN Nembhard*

Congenital microcephaly does not correlate with Zika virus, dengue and chikungunya infections in Southern Brazil
R Rohweder, AP Terra, FD Santa Maria, TO Schmalfuss, EJG Ataíde, TR Zarpelon, S Herber, L Friedrich, MTV Sanseverino, L Schüler-Faccini

Epidemiology and outcome of Hypoplastic Left Heart Syndrome in two different periods within the IMER registry: a retrospective study
G.Sperti, G.Ramacieri, C.Locatelli, S.Bonetti, F.Catapano, G.Astolfi, E.Ballardini, D.Prandstraller, L.Ragni, G. Cocchi

MRI Assisted Neurosonography (MAN). A Bi-Modality Simultanous comparative imaging technique in fetal brain malformation diagnostics
T Steiner , G Rudas, M Csáky-Szunyogh

Establishing a baseline estimate of the prevalence of neural tube defects in England ahead of the mandatory fortification of non-wholemeal wheat flour with folic acid
JM Broughan, D Martin, T Higgins, G Swan, A Cullum, S Stevens, A Tedstone, J Rankin

Prevalence of Neural Tube Defects Among Children in West Africa
MJ Takahashi, H Nabwera, N Medley

Linkage Strategy to improve the register of Congenital Heart Defects: a pilot study based on two Brazilian population-based surveillance tools
FSL Vianna, RB Pereira, BA da Silva, LK Krieck, TW Kowalski, B Moelcker, MH Barbian, SM Karam, L Schuler-Faccini

Posters – virtual presentation

(Alphabetical order by corresponding author's last name)

Presentations available at www.icbdsrtraining.org

Behçet's disease in Wales – A 15 year epidemiological description of an adult case series
A Ashman, D Tucker, C Williams, L Davies, M Morgan

The Identification and Prevalence of Cases with Oculo-Auriculo-Vertebral Spectrum using the Alberta Congenital Anomalies Surveillance System: Challenges and Opportunities
T. Bedard, RB Lowry, X Grevers, S Crawford, MA Thomas

Syndrome identification in surveillance systems using CDC/BPA coding
RH Benjamin, LE Mitchell, AE Scheuerle, PH Langlois, MA Canfield, M Drummond-Borg, JM Nguyen, AJ Agopian

Collaboration Between the Texas Birth Defects Registry and Agency Social Workers to Connect Children with Birth Defects to Health and Social Service Programs
D Betancourt, MA Canfield, MK Ethen, C Shumate, C Kubenka

An overview of birth defects and rare disease surveillance activities in South Africa
HL Malherbe, M Gomes, K du Plessis

Maternal Dietary and Supplemental Myo-inositol Intake during the Periconceptional Period is Associated with Reduced Risk of Congenital Heart Defects
R Cen, LJ Su, J Ying, MS Orloff, EH Bolin, XY Lou, CA Hobbs, LM Almli, LD Botto, ML Browne, RH Finnell, MM Jenkins, E Nestoridi, AF Olshan, PA Romitti, GM Shaw, WN Nembhard, and the National Birth Defects Prevention Study

Interaction between Maternal Periconceptional Myo-inositol and Folic Acid Intake on the Occurrence of Congenital Heart Defects in Offspring
R Cen, LJ Su, J Ying, MS Orloff, EH Bolin, XY Lou, CA Hobbs, LM Almli, LD Botto, ML Browne, RH Finnell, MM Jenkins, E Nestoridi, AF Olshan, PA Romitti, GM Shaw, WN Nembhard, and the National Birth Defects Prevention Study

Abstracts of Posters available at www.icbdsr.org/posters

Session I – Oral Presentations *(Meeting Room "Ginestra")*

Moderators:
Lavinia Schuler-Faccini, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Brazil.
Florence Rouget, Brittany Registry of Congenital Malformations, Rennes University Hospital, France

Birth defect surveillance and descriptive epidemiology I

Pilot-Project based on National Birth Registration System: Surveillance and Care for Congenital Anomalies in Rio Grande do Sul State, Brazil
Simone Karam

Seven Years' Experience of Birth Defect Surveillance in Bangladesh
Mohammad Abdul Mannan

Detection rates of a national fetal anomaly screening programme: a national cohort study
Sarah Stevens

Birth defect surveillance and descriptive epidemiology in Hungary MSMRI and MALFOVAR Registers
Tidhar Steiner

Creation of a congenital anomalies registry in south-west French area (ATENA). Systematic environmental exposures collection and automatisation of the collection
Julie Thomas-Chabaneix

Shiny application for monitoring congenital anomalies in Rio Grande do Sul, South of Brazil
Márcia Barbian

Algorithms for use of health care databases to improve the surveillance of congenital anomalies
Amanda J. Neville

Pilot-Project based on National Birth Registration System: Surveillance and Care for Congenital Anomalies in Rio Grande do Sul state, Brazil

SM Karam[1], O Artigalás[2], TSM Barreto[2], MS Bernardi[2], FSL Vianna[3], CF Lorea[4], JA Josahkian[5], MTV Sanseverino[6], G França[7], L Schüller-Faccini[6]

[1]Pediatrics Department - Post-Graduation Program in Public Health- Medicine Faculty - Universidade Federal do Rio Grande, Rio Grande, RS, Brazil; [2] Medical Genetics Unit, Conceição Children´s Hospital, Conceição Hospitalar Group, Porto Alegre, RS, Brazil; [3] Post-Graduation Program in Genetics and Molecular Biology, Genetics Department, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil; [4] Hospital Escola da Universidade Federal de Pelotas / EBSERH; [5] Hospital Universitário da Universidade Federal de Santa Maria / EBSERH; [6] Medical Genetics Service, Hospital de Clinicas de Porto Alegre, Brazil; [7] Department of Health Analysis and Surveillance of Non-Communicable Diseases, Ministry of Health, Brasilia, DF, Brazil.

Email of corresponding author: karam.simone@gmail.com
Birth Defects Program on which the work is based: Not applicable

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Background and Objectives: Congenital Anomalies (CA) are a significant cause of premature deaths and disabilities worldwide, including middle-income countries, such as Brazil, where CA are the second cause of infant mortality. Limited diagnostic resources and lack of information by general health professionals could lead to an underestimated impact of CA. Thus, it is fundamental to establish and to reinforce the surveillance systems focused on CA. Brazilian National Birth Registration System (SINASC) is a system which collects data for all births in Brazil. SINASC provides information on CA, including birth defects description and some maternal variables. However, SINASC until now is a passive surveillance system: Therefore, here we present a pilot study to implement an active surveillance system in the Rio Grande do Sul state, in Brazil with the possibility to be later extended to the entire country.

Methods: For the active surveillance, eight groups of anomalies were selected based on its prevalence, reliability of diagnosis at birth, impact on health and possibility of prevention and care in the public health systems in Brazil. A specific protocol on a secure database was developed to collect variables as prenatal risk factors, description of the anomalies and follow-up of the child up to one year of age. The GBDD app is being used in the surveillance mode, including photographs of the anomalies. Initially this protocol is being tested only in sentinel tertiary hospitals. This protocol allows inclusion of children not only at birth but up to one year of age. In parallel, a retrospective study to present and to analyze the baseline frequencies from the SINASC was implemented (abstract to be presented in this meeting), as well as training material for health professionals to improve the identification and accurate description of the anomalies.

Results: Educational tools were developed to improve and qualify CA registration, such as: a paper establishing priority congenital anomalies published in an open access journal; a free e-book divided and two sections, clinical and epidemiological. First part is addressed to health professionals and include the anomalies, etiology, concepts, classification, prevention, assessment, and adequate registration. The second one deeply analyses the epidemiology of birth defects in Brazil. A statistical app which allows to monitor CA by hospital, cities and geographical region. An on line free course covering the aforementioned anomalies, their appropriated registration and prevention, including tests and interactive simulated registration and basic CA information. According to the latest estimates almost one thousand students have enrolled. Free webinars for health professionals have also been offered.

Discussion and Conclusions: Data collected by this new tool have not been analyzed yet but observational analysis suggests registration and demands for CA evaluation are increasing in sentinel hospitals and the study of CA became popular among students and health professionals of these institutions. The educational materials are easily accessible, and course's second edition doubled its enrollments. However, we observe at least one limitation, CA is registered in the birth certificate form by a non-health professional what could cause some misinformation. The research group and Department of non-communicable diseases - Health Ministry have periodical webinars, promoting integrated action. Several projects are being conducted concerning active surveillance, including a before-and-after study. We believe this is a first step to improve registration, data collection and surveillance of CA in Brazil. Next step is to expand this project and promote educational activities outside sentinel hospitals and its regions.

Seven Years' Experience of Birth Defect Surveillance in Bangladesh

M Shahidullah, MA Mannan
Newborn Birth Defects Surveillance in Bangladesh, Department of Neonatology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh

Email of corresponding author: drmannan64@gmail.com

Birth Defects Program on which the work is based: Newborn Birth Defects Surveillance in Bangladesh

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Background and Objectives: Birth defect is an upcoming concern for Bangladesh as asphyxia and infections related deaths have been substantially reduced. Birth Defects surveillance program is now going on as "Strengthening and Expansion of Newborn Birth Defects (NBBD) Surveillance in Bangladesh" being implemented by Ministry of Health and Family Welfare. This program is funded by WHO-SEARO. Objective of the project is to define magnitude and pattern of birth defects in the selected participating centers.

Methods: This retrospective observational study is based on analysis of data submitted in NBBD database over seven years through 20 participating centers. Registered doctors, nurses, or assigned data entry personnel have been collecting data from delivery room, post natal ward and NICU in selected 20 hospitals across the country where BSMMU is acting as the nodal center. Data of all newborns with birth defects were entered into the NBBD database and analyzed for the period of January 2015 to December 2021.

Results: During this study period 482186 babies were delivered of which 4306 had birth defects making the prevalence of 0.89%. Among them 37% were preterm, 48% were low birth weight. Twelve percent had consanguinity. Twenty eight percent had maternal age >30 years. Birth defects were significantly more frequent among male (61%) newborns than females. According to the ICD code 10, birth defects involving musculoskeletal system were 26% followed by CNS malformation (19%), defects of circulatory system (15%), facial cleft (11%), digestive system (5%), genital system (5%), urinary system (5%), defects of face/neck/eye/ear (4%) and others (10%).

Discussion and Conclusions: Prevalence of the birth defects during the study period is 0.89% with males being frequent sufferers. Birth defects involving musculoskeletal system is on the top of the distributions. Strengthening and expansion of birth defects surveillance activities across the country are necessary to depict actual burden of the birth defects and to find out the way forward.

Detection rates of a national fetal anomaly screening programme: a national cohort study

N Aldridge[1], P Pandya[2], J Rankin[3], N Miller[1], J Broughan[1], N Permalloo[4], A McHugh[5], SStevens[1]
[1] National Congenital Anomaly and Rare Disease Registration Service, NHS Digital, UK; [2] University College London Hospitals NHS Foundation Trust, London UK; [3] Population Health Sciences Institute, Newcastle University, Newcastle UK; [4] Screening Quality Assurance Service, NHS England and NHS Improvement, UK; [5]NHS Fetal Anomaly Screening Programme, NHS England and NHS Improvement, UK

Email of corresponding author: sarah.stevens1@nhs.net
Birth Defects Program on which the work is based: England NCARDRS

Background and Objectives: The National Congenital Anomaly and Rare Disease Registration Service (NCARDRS) for England was established in 2015 to provide national surveillance of suspected and confirmed congenital anomalies for England, actively ascertaining clinical information from multiple sources across antenatal and postnatal settings. NCARDRS can accurately identify diagnoses following false negative screening results and developed an approach to auditing FA scan performance at a national level.
The aim of this study is to measure and evaluate condition-specific detection rates for 14 physical conditions screened for by the National Health Service for England fetal anomaly screening programme (FASP) fetal anomaly (FA) ultrasound scan, against FASP expected detection rates. The study measures detection rates within the context of an existing national screening programme, not to attempt to measure the sensitivity of the index test in a neutral or objective setting"

Methods: Retrospective audit of 12,694 diagnoses across a three-year national cohort. A total of 133 NHS hospitals in England offer the FA scan as part of FASP services, and three hospitals located in crown dependencies follow comparable FASP protocols. Pregnancies booked for maternity services with an expected date of delivery between 1 April 2017 to 31 March 2020 and at least one diagnosis of a condition screened for by FASP. Active multi-source ascertainment, linkage, audit, and validation of clinical information to identify the subset of diagnoses meeting the condition-specific positivity threshold for the FA scan. Diagnoses were captured after referral, postnatally, following termination of pregnancy for fetal anomaly (TOPFA), by other clinical services or in other parts of England. Main outcome measure, the accuracy of the FA scan compared to diagnostic reference standards.

Results: FA scan detection rates: anencephaly 96.3% (95% CI: 81.7-99.3%) , atrioventricular septal defect: 69.2% (65.8-72.4%), bilateral renal agenesis: 98.7% (95.4-99.6%), cleft lip: 89.5% (87.8-90.9%), congenital diaphragmatic hernia: 60.8% (56.5-65%) , Edwards' syndrome: 73.8% (67.5-79.3%), exomphalos: 59.4% (49.4-68.7%), gastroschisis: 88.6% (79-94.1%), hypoplastic left heart syndrome: 92.7% (90-94.8%), lethal skeletal dysplasia: 93.2% (88.6-96%), Patau's syndrome: 82.3% (72.4-89.1%), spina bifida: 93.8% (91.8-95.3%), tetralogy of Fallot: 75.4% (72.1-78.4%), transposition of the great arteries: 84.9% (81.7-87.5%).

Discussion and Conclusions: We report the first national audit of screening performance for the FA scan at 18-23 weeks of gestation. The performance of the FA scan is above the expectations set in 2010 for most conditions. For the remaining conditions, the majority of fetuses and babies are detected prior to the FA scan.
NCARDRS is able to inform FASP's national service evaluation and planning which have formed the basis of recommendations for changes to FASP Screening Standards. All hospitals were given bespoke reports and linked and enriched record level data on their audited participants for quality assurance and clinical audit. Lower level regional and anonymised provider level intelligence has also been made available for targeted training. This provides evidence of the value of a national register in supporting high quality clinical care with the population coverage, case ascertainment and expertise to link information which would otherwise exist in isolation.

Birth defect surveillance and descriptive epidemiology in Hungary MSMRI and MALFOVAR Registers

T Steiner[1], G Rudas[2], M Csáky-Szunyogh[3]
[1]Semmelweis University , Department of Obstetrics and Gynecology, department of Medical Imaging; [2]Heim PAL National Children's Hospital , Mind Clinic; [3]NNK / VRONY / NNMR (Hungarian Institute of Public Health fetal malformations register)

Email of corresponding author: drsteiner@live.com
Birth Defects Program on which the work is based: VRONY Hungary

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Background and Objectives: The aim of the MSMRI register is to collect all fetal anomalies that have been analyzed by the Semmelweis University and Heim Pal National Children's Hospital with MRI and Ultrasound as a Bi-Modality comparative imaging register. The register collects all types of fetal anomalies but due to clinical needs the main field of expertise is developmental neuroradiology. The aim of the MALFOVAR register is to collect Human malformations and variable anatomy changes (VAC) at any age: in fetuses , children and adults.

Methods: Both registers activities are supported by IRG: The foundation for living children with Central Nervous system anomalies. The source of the register is medical imaging (IMPACS) and its interpretation documentation (MEDSOL). MALFOVAR (Malformations and variable anatomy register) is an email based register of Semmelweis University and NNK / VRONY / NNMR (Hungarian Institute of Public Health fetal malformations register) in Hungary.

Results: For the MSMRI register period of data collection: 2007 to 2022 (15 years).We have collected 403 cases and classified them according to disease , HPO. During the lecture we will present the statistics and breakup of cases given in the register .For the MALFOVAR register Period of data collection 2007 until 2022 (15 years). We have collected total of 460 cases . During the lecture we will present importance and relevance of collection of malformation at any age including late adulthood and the importance of VAC (variable anatomical changes).

Discussion and Conclusions: This the first time in Hungary in which we combine a malformation registary with Bi-modality comparative imaging registary (MSMRI). The importance of MALFOVAR is that we collect VAC which are variable anatomical changes. (with similarities to VUS in genetics). Detecting VAC(mild type malformation spectrum)in broad patinet population including late adulthood may teach us on the developmental biological mechanisms of serious malformations and hint for possible mechanisms of development and future prevention. The Integration of Clinical findings (text documentations) ,Imaging findings and Genetic database maybe uploaded in the future to AI Platform to try to predict outcome and prognosis of disease and develop new tools to assist in population detection and prevention.

Creation of a congenital anomalies registry in south-west French area (ATENA). Systematic environmental exposures collection and automatisation of the collection

J Thomas-Chabaneix[1], R Griffier[2], AC Huby[1], O Maurel[3], H Peyrouzet[4], F Francis-Oliviero[5], C Rooryck-Thambo[6], M Savès[7], F Delva[8]

[1]Department of Pediatric and Adult Congenital Cardiology, Bordeaux University Hospital, Pessac, France. CIC 1401, Bordeaux;[2]Bordeaux Univ. Hospital, Public Health Unit, Medical Information Department, F-33000 Bordeaux, France. CIC 1401, Bordeaux.Univ. of Bordeaux, Inserm UMR 1219, Bordeaux Population Health Research Center, team ERIAS, F-33000 Bordeaux, France. CIC 1401, Bordeaux; [3]Bordeaux Population Health Research Center, Inserm UMR1219-EPICENE, University of Bordeaux, Talence, France. CIC 1401, Bordeaux; [4] Public Health Unit, Department of Medical Pharmacology, Regional Pharmacovigilance Center, Bordeaux University Hospital, Bordeaux, France.CIC 1401, Bordeaux; [5]Bordeaux Univ. Hospital, Department of Public Health, F-33000 Bordeaux, France. Bordeaux Population Health Research Center, Inserm UMR1219-EPICENE, University of Bordeaux, Talence, France. CIC 1401, Bordeaux; [6]Bordeaux Univ. Hospital, Department of Medical Genetics, Bordeaux, France. CIC 1401, Bordeaux; [7]Univ. Bordeaux, ISPED, 33000, Bordeaux, France; Medical Information Service, Public Health Department, Bordeaux University Hospital, 33000, Bordeaux, France. CIC 1401, Bordeaux; [8]Bordeaux Population Health Research Center, Inserm UMR1219-EPICENE, University of Bordeaux, Talence, France. Environmental Health Platform Dedicated to Reproduction, ARTEMIS Center, Bordeaux University Hospital, Bordeaux, France. CIC 1401, Bordeaux

Email of corresponding author: julie.thomas@chu-bordeaux.fr - Birth Defects Program on which the work is based: Santé Publique France (French National Surveillance for Birth Defects)

Background and Objectives: It is estimated that, for about 50% of congenital anomalies (CA), no specific associated cause is identified. Under the impulsion of Santé Publique France (SPF), we created a 7th registry, named ATENA, in Nouvelle-Aquitaine state. The aim is to complement the six existing French registries, in order to strengthen the surveillance of CA by increasing the coverage of the territory and by developing new tools to implement the surveillance. The objectives of this communication are to present (1) a self-administered questionnaire to identify environmental risk factors within the registry and (2) the method of an informatics system to semi-automate case identification.

Methods: We created a multidisciplinary team of pediatricians, geneticists, pharmacovigilance experts, environmental health specialists, epidemiologists and medical computer experts within Bordeaux University Hospital. All cases from mothers who lived in Nouvelle-Aquitaine during part of/their pregnancy will be collected (fetuses from 22 weeks to children 1 year of life).About 2300 cases are expected per year. In partnership with ARTEMIS center(Aquitaine Reproductive Childhood Maternity and Environmental Health Impact),we created an online self-administered environmental questionnaire to systematically collect drug and environmental exposure data. We will assess the feasibility of semi-automated case identification (phenotyping) and data collection based on clinical data warehouses available within the hospital. The generalization of phenotyping algorithms developed on the clinical data warehouse of the Bordeaux Hospital will be evaluated in other health care institutions covered by the registry.

Results: The environmental questionnaire, validated by the ethics committee, is collecting exposures from the mother during pregnancy but also from both parents 3 months before pregnancy. It's collecting prescribed and non prescribed drug treatments, places of residency and of work, type chemical exposures (household products, cosmetics, pesticides, chemicals,...), home environment data (construction, renovation, pets), tobacco, alcohol and recreational drug usages and social environment. The questionnaire aims to be comprehensive but not overbearing for the parents. For case identification, phenotyping methods are being developed based on standardized data (such as prescription, procedures, diagnosis coded in standard terminology (ATC, CCAM, ICD10…)) and free text using Natural Language Processing methods (such as Names Entity Recognition (NER) or Entity Linking). The supervised classification models will be trained using the cases identified and validated in the ATENA registry (gold standard).

Discussion and Conclusions: Collection of data will start in the second semester of 2022. The environmental questionnaire will be launched within the coming months. An evaluation of this tool will be performed after a year of use (rate of answer, questions unfilled,…). The semi-automated system should be operational for Bordeaux Hospital, for the 21 main anomalies (Eurocat classification), end of 2023. Deployment and adaptability to other institutions will be then evaluated in order to automatized the detection of congenital anomalies in the future.

Shiny application for monitoring congenital anomalies in Rio Grande do Sul, south of Brazil

MHBarbian[1], BA Silva [2], GR Boff[2], LM Mariath[3], TW Kowalski[3], RB Pereira[2], FSL Vianna[4], SM Karam[5], L Schüler-Faccini[4]

[1] Post-Graduation Program in Statistics, Statistics Department, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil; [2] Statistics Department, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil.; [3] Post-Graduation Program in Genetics and Molecular Biology, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil; [4] Post-Graduation Program in Genetics and Molecular Biology, Genetics Department, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil. Post-Graduation Program in Medical Science- Medicine Faculty - Universidade Federal do Rio Grande, Rio Grande, RS, Brazil; [5] Universidade Federal do Rio Grande, Departamento de Pediatria, Rio Grande do Sul, Brasil

Email of corresponding author: mhbarbian@gmail.com
Birth Defects Program on which the work is based: Birth defect surveillance and descriptive epidemiology

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Background and Objectives: Congenital anomalies (CAs) are structural and/or functional abnormalities that originate before birth, being one of the main causes of infant mortality in Brazil. Epidemiological surveillance systems in CAs are important to establish health care and attention policies. In such systems, data visualization and analysis tools make it possible to inform managers and health professionals about the spatial and spatio-temporal characteristics of ACs. Objectives: To provide an open access web application to facilitate researchers and public administrators in monitoring CAs in the state of Rio Grande do Sul (RS).

Methods: The application was developed in R language, using the shiny package, which is possible to create interactive web applications. The database used to generate the results required by the user was obtained through the Information System on Live Births (SINASC) and refers to births in Rio Grande do Sul state (south of Brazil) between the years of 2010 and 2019. Cases were registered by the mother's municipality of residence and according to the International Classification of Diseases (ICD-10). Nine groups of CAs were considered: Congenital heart defects (Q20-Q28), Abdominal wall defects (Q79.2, Q79.3), Limb reduction defects/clubfoot/arthrogryposis/polydactyly (Q66, Q69, Q71, Q72, Q73, Q74.3), Neural tube defects (Q00.0, Q00.1, Q00.2, Q01, Q05), Orofacial clefts (Q35, Q36, Q37), Hypospadias (Q54), Microcephaly (Q02), Sex indefinite (Q56) and Down Syndrome (Q90). This study is part of a major project for CAs surveillance in Brazil, and it was approved by the Ethics Research Committee.

Results: The application offers several functionalities: number of live births, number of live births with CAs and prevalence at birth of CAs; graphic analysis; maps that allow understanding the spatial variation of cases of ACs over time in the municipalities or health macro-regions of Rio Grande do Sul; spatial association analysis; and detection of active spatio-temporal clusters in the state. The Shiny application can be accessed through https://projetoanomaliascongenitas.shinyapps.io/ac_rs/.

Discussion and Conclusions: It is expected that the application can help the health surveillance strategies focused on CAs in the Rio Grande do Sul state, indicating how the numbers of cases are distributed between municipalities and different regions. This web application can contribute to the policies make-decisions, for distribution of resources in health care in the state. We hope to apply the same approach to other Brazilian states.

Algorithms for use of health care databases to improve the surveillance of congenital anomalies

AJ Neville, G Astolfi, E Ballardini
IMER Registry, Centre for Epidemiology and Clinical Research, University of Ferrara

Email of corresponding author: nvm@unife.it
Birth Defects Program on which the work is based: EUROlinkCAT

Background and Objectives: Electronic healthcare databases (HCD) can be a source of useful data for congenital anomaly (CA) surveillance and research, but only after careful evaluation. Databases often have different aims such as financial reporting and use another coding system than used in the CA surveillance network. Whereas CA registries in the beginning depended on individual case identification – either sent to the registry by clinicians or actively searched for in clinical records, the last decade has seen an increase in the use of electronic healthcare records as a data source for individual cases. The possibility for registries to ascertain cases by searching for congenital anomaly codes in hospital discharge database is becoming more widespread.

Methods: The algorithm was developed using the experience of the EUROCAT registries in data extraction.
A questionnaire was developed to see if registries use HCD, how they use them and if they have any algorithms/rules of their own. The questionnaire included the list of limitations of HCD listed above (see questionnaire - Appendix 1). All EUROCAT registries were asked to complete the questionnaire and provided with a link to it. There were 19 replies out of the 49 full, associate, and affiliate member registries.
Information was collected comparing data extraction methods and data validation. Individual teleconferences were then conducted with the congenital anomalies registries of Scotland (CARDRISS), Northern Netherlands, Denmark (Odense), and England (NCARDRS), which had indicated that they did have experience in using algorithms to extract data from HCD.

Results: A detailed algorithm has been created and made available to produce high quality case ascertainment and classification following the EUROCAT Guide 1.4 It can be used and programmed by CA registries in their own computer languages.

Discussion and Conclusions: The proposed algorithm allows the creation of a CA Registry exclusively through healthcare databases, and the use of electronic health records ensure a sufficiently complete coverage of geographical areas. Where a CA Registry is already present, the algorithm may be used to integrate the cases identified by healthcare professionals. A clear advantage is also the speed with which large databases can be analyzed, reducing to a minimum the cases which need to be confirmed by checking the clinical records. Indeed, 'validated' cases have low likelihood to be false positive, and 'excluded' cases have low likelihood to be false negatives, therefore both categories do not require manual checking of the clinical records.
However, the algorithm also has weakness . The quality of the information on CA depends on the coding used. Detecting rare or severe anomalies may require additional databases. The algorithm also does not include terminations of pregnancy for fetal anomaly (ToPFA).

Session II – Oral Presentations *(Meeting Room "Ginestra")*

Moderators:

Cecilia Mellado, School of Medicine, Pontificia Universidad Catolica de Chile

Sarah Stevens, National Congenital Anomaly and Rare Disease Registration Service (NCRDRS), NHS Digital, UK

Birth defect surveillance and descriptive epidemiology II

Neural tube defects in the Czech Republic: incidence, prenatal diagnostics and sex ratio
Antonin Šípek, Jr

Prevalence of CHD in Emilia Romagna, Italy
Elisa Ballardini

Congenital Diaphragmatic Hernia: What can the National Congenital Anomaly and Rare Disease Registration Service (NCARDRS) tell us?
Kathryn Johnson

A multi-program analysis of Cleft Lip with Cleft Palate prevalence and mortality using data from 22 International Clearinghouse for Birth Defects Surveillance and Research programs, 1974-2014
Niall J. McGoldrick

Epidemiologic characteristics of patients with microtia in Cali and Bogotá during 2020 and 2021
Maria Camila León Sanabria

Isolated Fetal Ascites in Wales 1998-2019
Odai Yaghi

Covid vaccine and birth defects -CDC's v-safe pregnancy registry data
Jennita Reefhuis

Neural tube defects in the Czech Republic: incidence, prenatal diagnostics and sex ratio

A Šípek Sr[1,2,3], V Gregor[1,2], A Šípek Jr[1,4,5], J Klaschka[6], M Maly[6,7]
[1] Department of Medical Genetics, Thomayer Hospital, Prague, Czech Republic; [2] Department of Medical Genetics, Pronatal Sanatorium, Prague, Czech Republic; [3] GENNET, Prague, Czech Republic; [4] Institute of Biology and Medical Genetics, First Faculty of Medicine, Charles University, Prague, Czech Republic; [5] Institute of Medical Genetics, Third Faculty of Medicine, Charles University, Prague, Czech Republic; [6] Institute of Computer Science of the Czech Academy of Sciences, Prague, Czech Republic; [7] National Institute of Public Health, Prague, Czech Republic

Email of corresponding author: antonin.sipek@lf1.cuni.cz
Birth Defects Program on which the work is based: National Registry of Congenital Anomalies of the Czech Republic

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Background and Objectives: Neural tube defects (NTD) are an important group of congenital anomalies of the central nervous system. A lot of these structural anomalies are associated with important neurological impairment and generally, the NTDs are considered to be an important cause of neonatal mortality and morbidity. The analysis of incidences of NTDs is important for evaluating the effects of primary prevention (like folic acid usage) and ultrasound screenings. We present a retrospective long-term study of population incidences of the main group of NTDs with a focus on changes in prenatal diagnostics of these anomalies.

Methods: We have used the official data from the National Registry of Congenital Anomalies of the Czech Republic. This registry is a part of the National Registry of Reproductive health, which is run by the Institute for Health Information and Statistics of the Czech Republic. The registration process is population-wide and compulsory by national law. For our study, we have used the data for the 1961-2020 time period. The analyzed diagnoses were: anencephaly, encephalocele and spina bifida. We analyzed the absolute and relative incidences of these anomalies and the percentage of prenatally and postnatally diagnosed cases.

Results: During the study period, there were 2521 cases of anencephaly, 3391 cases of spina bifida, and 704 cases of encephalocele. For anencephaly, 1456 cases were diagnosed at birth and 1065 cases were diagnosed prenatally (and pregnancies were electively terminated). For spina bifida, 2451 cases were diagnosed in born children and 940 cases were prenatally diagnosed. For the encephalocele, there were 390 cases in born children and 314 in prenatal diagnostics. During the selected period we can easily observe the effect of the introduction of ultrasound screenings in prenatal care which significantly changed the ratio of NTDs diagnosed prenatally and after birth.

Discussion and Conclusions: NTDs are reported in our registry from its very beginning in the 60ties of the last century. Therefore we were able to do long-term analysis of the incidences and their trends. The major factor which affected the incidences of NTDs diagnosed in born children was surely the implementation of ultrasound prenatal examination. Sadly, we cannot provide detailed information about folic acid usage (and its effect) as these data are not available on the population level in our medical registries.

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Prevalence of CHD in Emilia Romagna, Italy

E Ballardini[1], G Cocchi[2], G Astolfi[3], AJ Neville[3]
[1] Neonatal Intensive Care Unit, Paediatric Section, IMER Registry (Emilia Romagna Registry of Birth Defects), Dep. of Medical Sciences, University of Ferrara, Italy; [2] Alma Mater Studiorum Bologna; [3] Emilia Romagna Registry of Birth Defects and Center for Clinical and Epidemiological Research, University of Ferrara, Azienda Ospedaliero- Universitaria di Ferrara

Email of corresponding author: elisa.ballardini@unife.it
Birth Defects Program on which the work is based: IMER Registry, Italy

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Background and Objectives: Congenital heart disease (CHD) is the most common group of major congenital anomalies (CA) in the IMER registry (the Emilia-Romagna Registry, Italy) in EUROCAT(European surveillance of congenital anomalies) and in the global literature. CHD represents about one third of all major CA.
CHD prevalence has shown an increase in the last decades due to improvement in prenatal diagnosis, pulse oximetry screening for CHD, and postnatal detection rate. Current prevalence is 9-10 per 1000 live births.
Our aim is to present prevalence of CHD in Emilia Romagna, Italy.

Methods: Data are extracted from IMER registry, a population-based congenital anomaly database covering the first year of life, active since 1978. IMER uses multisource ascertainment, including hospital discharge records (HDR) from 2009, through a validated algorithm to recognize CA not communicated to the registry by clinicians. The registry follows EUROCAT coding guidelines and CA definitions. Analyzed period: 2000-2019 included.

Results: CHD prevalence rose from 6.5 to 9.3 per 1000. The increase is mostly after 2009, while from 2015 the value is stable. The analysis must consider the distribution of CHD cases and the characteristics of the registry:
- Severe CHD: prevalence stable, with a small increase (2 to 2.5 per 1000); one third of CHD. Less severe: mostly ventricular septal defects (VSD), more than 80% isolated, showing a clear increase between 2007 (1.5 per 1000) and 2015 (4 per 1000).
- The increase of CHD is due to increase in VSD, mostly to cases from the HDR. Improvements in prenatal and postnatal detection lead to coding in HDR of smallest VSD, including cases that close in the first months of life.
In the last decade the prevalence is stable at around 9 per 1000. About 80% of CHD are isolated; of the remaining 20%, one half are multiple cases. The syndromes most often detected are Di George and Noonan whilst Down syndrome is the most prevalent chromosomal disease. TOPFA cases are 15% of severe CHD."

Discussion and Conclusions: After an increase due to clinical improvement and methodological reasons, CHD prevalence in the IMER registry is stable between 9-10 per 1000. The increase is mainly due to increase in coding VSD. Severe CHD represent one third of cases. CHD are mostly isolated and mainly live births.

Congenital Diaphragmatic Hernia: What can the National Congenital Anomaly and Rare Disease Registration Service (NCARDRS) tell us?

K Johnson[1,2], J Brougham[1], C Mallinson[1], S Hardy[1], S Stevens[1]
[1] *National Congenital Anomaly and Rare Disease Registration Service, UK;* [2] *Leeds Children's Hospital, Leeds, UK*

Email of corresponding author: kathrynjohnson1@nhs.net
Birth Defects Program on which the work is based: NCARDRS

Background and Objectives: NCARDRS is a registration service that collects and quality assures data on congenital anomalies and rare diseases in England. NCARDRS forms part of the National Disease Registration Service (NDRS); previously established by Public Health England and now maintained by NHS Digital.
Antenatal screening for Congenital Diaphragmatic Hernia (CDH) forms part of the NHS Fetal Anomaly Screening programme (FASP). As NCARDRS collects information on anomalies collected both antenatally and postnatally, NCARDRS works closely with the NHS Fetal Anomaly Screening Programme (FASP) to audit the detection of the 15 conditions included in the 20 week scan, including CDH. We aim to describe the live birth prevalence of CDH from 2015 – 2019 in England along with genetic data and data for associated anomalies.

Methods: Using NCADRS data the prevalence of CDH in babies born 2015-2019 in reporting regions of NCARDRS was calculated per 10,000 live and still births.

Results: There were 752 cases of CDH period studied. 72% were born alive. Of the babies born alive 68% were alive at 1 year of age. The total CDH prevalence (live births, stillbirths and termination of pregnancies) per 10,000 births ranged from 3.33 to 4.28 in the years between 2015 and 2019. The commonest associated structural anomaly was congenital heart disease with 22.4% of all cases of CDH having associated congenital heart disease. Of those who had a genetic test, 20% of the cases in the dataset, had an abnormal test.

Discussion and Conclusions: Our data show the current live and total birth prevalence of CDH in England; NCARDRS can link this data to other routinely collected data building a clinical picture of CDH after birth and in to childhood, in addition to basic prevalence data. CDH is not infrequently associated with chromosomal abnormalities and other congenital anomalies. NCADRS ability to provide national prevalence data on the condition along with linkage to multiple other data sources provides an opportunity to obtain valuable information on the potential causes of congenital anomaly, clinical treatment, associated morbidities and outcomes into adulthood for these children.

A multi-program analysis of Cleft Lip with Cleft Palate prevalence and mortality using data from 22 International Clearinghouse for Birth Defects Surveillance and Research programs, 1974-2014

N Mc Goldrick[1], G Revie[1], P Mossey[1], et al
[1] *School of Dentistry, University of Dundee, Dundee, Scotland, DD1 4HN, and 22 co-authors from ICBDSR registries*

Email of corresponding author: nmcgoldrick001@dundee.ac.uk
Birth Defects Program on which the work is based: 22 ICBDSR Registries that have submitted data for the Clefts Mortality project

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Background and Objectives: Cleft lip with cleft palate (CLP) is a congenital condition that affects both the oral cavity and the lips. This study estimated the prevalence and mortality of (CLP) using surveillance data collected from birth defect registries around the world.

Methods: Data from 22 population- and hospital-based surveillance programs affiliated with the International Clearinghouse for Birth Defects Surveillance and Research (ICBDSR) in 18 countries on live births (LB), still births (SB) and elective terminations of pregnancy for fetal anomaly (ETOPFA) for CLP born from 1974-2014 were analysed. Prevalence and survival estimates were calculated for total and sub-classifications of CLP and by pregnancy outcome.

Results: The pooled prevalence of total CLP cases was 6.4 CLP per 10,000 births. The prevalence rate of CLP and all of the pregnancy outcomes varied across programs. Higher ETOPFA rates were recorded in most European programs compared to programs in other continents. In programs reporting low ETOPFA rates or where there was no ascertainment of ETOPFA the rate of CLP among LB and SB was higher compared to those where ETOPFA rates were ascertained. Overall survival for total CLP was 91%. For isolated CLP the survival was 97.7%. CLP associated with multiple congenital anomalies had an overall survival of 77.1% and for CLP associated with genetic/chromosomal syndromes overall survival was 40.9%.

Discussion and Conclusions: Total CLP prevalence reported in this study is lower than estimates from prior studies, with variation by pregnancy outcomes between programs. Survival decreased when CLP was associated with other congenital anomalies or syndromes compared to isolated CLP.

Epidemiologic characteristics of patients with microtia in Cali and Bogotá during 2020 and 2021

K Sarmiento[1], A Carreño[2], MC León[3], AM Urueña[4], P Hurtado[2], I Zarante[3,5]
[1]Department of Physiological Sciences at the Faculty of Medicine of the Pontificia Universidad Javeriana (Bogotá, Colombia); [2]Department of Basic Health Sciences at the Faculty of Health Sciences of Pontificia; niversidad Javeriana (Cali, Colombia); [3] Human Genetics Institute of the Pontificia Universidad Javeriana (Bogotá, Colombia); [4] Birth defects surveillance of the Secretary of Health (Bogotá, Colombia); [5] Hospital Universitario San Ignacio (Bogotá, Colombia)

Email of corresponding author: leonmaria@javeriana.edu.co
Birth Defects Program on which the work is based: Bogota Congenital Malformations Surveillance Programme (BCMSP), Cali Birth Defects Surveillance Program (CBDSP)

Background and Objectives: Microtia is a major malformation of the auricle that presents a spectrum that goes from a slight decrease in size to its total absence (anotia). Microtia can occur as an isolated condition, as part of a spectrum of abnormalities, or associated with a syndrome, it can occur unilaterally or bilaterally. The unilateral form is more common, present in up to 93% of cases. In addition to the external ear, microtia can affect the middle ear and produce hearing alterations that in 80-90% are associated with conductive hearing loss and in a minority with sensorineural or mixed hearing loss. The prevalence varies between regions with a rate from 0.83 to 17.4 per 10,000 births, being higher in Hispanics, Asians, Native Americans, and Andeans. Therefore, our objective was to carry out a characterization of the microtia of newborns from the cities of Bogotá and Cali, in Colombia during 2020 and 2021.
Methods: The report of the record 215 of mandatory notification for the congenital defects event was used, in which the anomalies are described according to the ICD-10 classification and sociodemographic variables are also recorded. Data from live newborns weighing more than 500 g born in Bogotá and Cali during 2020 and 2021 diagnosed with any type of microtia (Codes Q172, E720, Q793, Q046, Q160, Q161) were analyzed. Microtia was classified according to its presentation as "isolated" or “multiple congenital anomalies”. The time of delivery was defined according to the WHO criteria according to the weeks of gestation in delivery at term (>37 weeks), premature (32-37 weeks), very premature (28-32 weeks) and extremely premature (< 28 weeks). The weight of the newborn was analyzed as a dichotomous variable, being low weight <2500g and adequate >2500g, and later it was analyzed in association with the time of delivery.
Results: The prevalence rate per year and city was calculated, finding an increase in Bogotá from 2020 to 2021, with a rate of 7.6/10,000 to 8.54/10,000. In Cali, there was also an increase from 2020 to 2021 from 4.07/10,000 to 6.22/10,000. The average maternal age was 28.22 years (SD 6.25). A higher frequency was found in males 54.3%. 149 cases of microtia were found, 77% isolated and 23% with multiple congenital anomalies. 60% does not report laterality, right microtia was described in 23.8%, left in 11.5%, and bilateral microtia in 4.6% of cases. In the group with multiple congenital anomalies group, a total of 64 anomalies other than microtia were found. The highest frequency was orofacial anomalies 10.1%, followed by cardiovascular 9.4%, limb 4.7% and gastrointestinal 4%. Delivery was preterm in 20.1% of the cases. 12.1% had a history of chronic maternal disease, where 44.4% of the deliveries were preterm. The most frequent chronic disease was severe preeclampsia 22.3%.
Discussion and Conclusions: The prevalence of microtia was found to be higher than what has been reported in other studies (2.06-2.38), although similar to the prevalence in Central and South American populations. The findings regarding sex, laterality and presentation were similar to what has been reported in the literature, with a higher percentage of cases being males, most cases being unilateral with a higher predominance of the right side, and with most cases being isolated. Among those with multiple congenital anomalies, it is reported that the most common associated anomalies are cardiovascular, orofacial and limb anomalies, which is consistent with our findings but also include vertebral and renal anomalies. Microtia continues to have a high prevalence in Colombian cities, especially in Bogota, so surveillance of risk factors should be managed through a specific epidemiological surveillance and monitoring program that allows associations and correlations to be identified and prevent hearing disabilities.

Isolated Fetal Ascites in Wales 1998-2019

O Yaghi, D Tucker, M Morgan
Obstetrics and Gynaecology, Singleton Hospital, Wales, UK

Email of corresponding author: odai.yaghi@gmail.com
Birth Defects Program on which the work is based: CARIS, Congenital Anomaly Register and Information Service, Wales, United Kingdom

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Background and Objectives: Fetal ascites is an abnormal fluid collection in the peritoneal cavity. Hydrops fetalis (fetal hydrops) is defined as an abnormal accumulation of fluid in two or more fetal compartments. This study describes isolated fetal ascites in Wales from 1998 to 2019.

Methods: Retrospective review of non-immune isolated fetal ascites data from the Congenital Anomaly Register of Wales (CARIS) data over 22 years. Gestation at diagnosis, causes and outcomes were assessed. Cases with additional hydropic features were excluded.

Results: There were 67 cases of isolated fetal ascites identified from 241 pregnancies with fetal ascites, from a total of 308 cases with hydropic features. 30 of the 67 cases had one or more congenital anomalies, 15 were genitourinary, 12 were neurological, 12 were gastrointestinal, and 7 were chromosomal. 7 cases recorded with only fetal ascites. 11 out of 36 cases that were terminated or lost had a genitourinary tract anomaly associated with the ascites. There were 12 cardiac cases in the 31 live births. 20 cases were detected before 20 week and 12 of them were terminated (5 had one or more genitourinary anomaly, 4 with neurological anomalies, 2 intrauterine infections and 1 had chromosomal anomaly) There were 6 stillbirths (1 without any other anomalies, 2 had neurological defect, 2 with gastrointestinal anomalies, and 1 intrauterine infection) and 2 live births in this early detected group (1 had chromosomal anomalies and 1 with Gastrointestinal and neurological defects).**Discussion and** Of those 29 detected between 20 and 28 weeks, 12 were terminated, 3 were stillborn, and 14 were born alive (4 had cardiovascular anomalies, 2 without any other anomalies, 2 had genitourinary defects, 1 with chromosomal anomaly, 1 had neurological/spine defects, 1 with pulmonary anomalies, 1 had haematological disease, 1 had an intrauterine infection, and 1 had musculoskeletal defects).
16 cases were detected after 28 weeks. None were terminated, 2 were stillborn (1 with chromosomal anomaly and 1 had cardiovascular defects), and 14 born alive (4 had cardiovascular anomalies, 3 without any other anomalies, 2 had gastrointestinal defects, 1 had neurological/spine anomalies, 1 had an intrauterine infection, and 1 with genitourinary anomaly).

Discussion and Conclusions: This is a relatively large study that shows that early diagnosis of isolated fetal ascites is a poor prognostic feature. Fewer than 50% of cases had a structural anomaly. Cardiac and genitourinary anomalies were the most frequent."

COVID-19 vaccines during pregnancy and birth defects; preliminary data from V-Safe COVID-19 Vaccine Pregnancy Registry, United States 2021

J Reefhuis[1,2], LH Zauche[1,3,4], SA Madni[1,3,4], JD Cragan[2], CA Moore[2,5] , RM Simeone[1,6], JF Nahabedian[1,7], E Petersen[1,4], T Johnson[1,3,4], CK Olson[1,4] on behalf of the CDC v-safe COVID-19 Pregnancy Registry team
[1]CDC COVID-19 Response Team; [2]Division of Birth Defects and Infant Disorders, National Center on Birth Defects and Developmental Disabilities, CDC; [3]Eagle Health Analytics, Atlanta, GA; [4]Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [5]Goldbelt Professional Services; [6]Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; [7]Eagle Global Scientific, Atlanta, GA

Email of corresponding author: nzr5@cdc.gov
Birth Defects Program on which the work is based: Not applicable

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Background and Objectives: Pregnant people are at increased risk for severe illness and complications from COVID-19. In the US, COVID-19 vaccination is recommended for pregnant people. There are limited data on the occurrence of birth defects after COVID-19 vaccination during pregnancy. Describe birth defects among pregnancies of people who received a COVID-19 vaccine during pregnancy.

Methods: V-safe is an active smartphone-based safety surveillance monitoring system developed by CDC to monitor the safety of COVID-19 vaccines. All participants reporting a pregnancy between December 2020 and May 2021 were invited to participate in the v-safe COVID-19 Vaccine Pregnancy Registry phone interview. Vaccination information was entered into v-safe by participants and confirmed during the interview. Participants were asked whether their fetus or infant was diagnosed with any birth defects or medical conditions; clinicians reviewed the participants' verbatim responses. Analyses described participant demographics, reported birth defects, and compared the rate of birth defects among participants receiving at least one mRNA vaccination in the month before pregnancy or the 1st trimester to those receiving an mRNA vaccination after 20 weeks' gestation.

Results: While interviews are ongoing, 11,105 participants completed the pregnancy outcome survey by January 10, 2022. We excluded 495 participants with either a miscarriage, ectopic, or tubal pregnancy, 211 participants with a multiple gestation pregnancy, and 388 participants reporting COVID-19 infection during pregnancy leaving 10,011 participants. Vaccine types included Pfizer-BioNTech (55%), Moderna (40%) and Johnson & Johnson's Janssen (5%). The mean participant age was 32.9 years, and two-thirds of participants were health care workers. Major birth defects were reported for 331 fetuses and infants, and in 3.7%, 2.9%, and 3.6% of the fetuses and infants of those receiving their first eligible vaccine dose in the 1st, 2nd, or 3rd trimester, respectively; specific birth defect review is ongoing.

Discussion and Conclusions: mRNA COVID-19 vaccination in early pregnancy was not associated with an overall increase of birth defects in this convenient cohort of mostly health-care workers. This is the first report of birth defects from a U.S. COVID-19 vaccine pregnancy registry. These findings contribute to the growing evidence of safety of COVID-19 vaccination during pregnancy, which may reassure pregnant people and allow healthcare providers to better counsel patients.

Session III – Oral Presentations *(Meeting Room "Ginestra")*

Moderators:
Adriana Benavides Lara, Centre of Congenital Disease Registry (CREC), Costa Rica
Wendy N. Nembhard, University of Arkansas for Medical Sciences, Little Rock, USA

Risk and protective factors for birth defects

How Birth Defect Surveillance Systems are Informing the Impact of Food Fortification with Folic Acid on the Birth Prevalence of Neural Tube Defects
Helena Pachón

Neural Tube Defects and Folic Acid Effects: Clarifying and Expanding the Phenotype
Cara T. Mai

Zika Virus-associated birth defects among live births in Costa Rica 2016-2018
Adriana Benavides-Lara

A novel investigation of seropositivity to chlamydia among women prenatally diagnosed with and without gastroschisis
Marcia L. Feldkamp

Neighborhood Deprivation During Pregnancy and Risk of Early and Late Stillbirths
Wendy N. Nembhard

Hypothyroidism in patients with Down Syndrome: prevalence and association with congenital heart defects
Francesca Gorini

Neonates infected and/or born to mothers with SARS-CoV-2 during pregnancy or peripartum, hospitalized in French level 3 neonatal intensive care units (NICUs): a reactive national surveillance system
Julie Boudet-Berquier

How Birth Defect Surveillance Systems are Informing the Impact of Food Fortification with Folic Acid on the Birth Prevalence of Neural Tube Defects

H Pachón[1,2], BL Tsang[2,3], M Duong[2,3], K Codling[2,3], F Vasta[2,4]
[1] *Food Fortification Initiative, USA;* [2]*Global Fortification Data Exchange, USA;* [3]*Iodine Global Network, Canada;*
[4]*Global Alliance for Improved Nutrition, Switzerland*

Email of corresponding author: helena.pachon@emory.edu
Birth Defects Program on which the work is based: Not applicable

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Background and Objectives: In the late 1990s, several countries mandated the fortification of grains with folic acid to prevent neural tube defects (NTDs). Since then, a total of 67 countries have included folic acid in their standards for the obligatory fortification of wheat flour, maize flour, or rice. The Global Fortification Data Exchange (FortificationData.org) monitors studies that have assessed a health or functional outcome before and after legislation of mandatory fortification. In the case of folic acid fortification, this includes reporting of NTDs. The objective of this presentation is to share birth defect surveillance data used to inform the impact of food fortification with folic acid on NTDs.

Methods: The Global Fortification Data Exchange (GFDx) website was reviewed for studies that reported neural tube defects as an outcome in countries with mandatory fortification of wheat flour, maize flour, or rice. For studies to be included in the GFDx, they had to report pre- and post-fortification data using the same numerator (e.g., number of spina bifida cases) and denominator (e.g., live births and still births). Studies were assessed for the following information: was a birth defect surveillance system used to gather NTD information (yes/no) and if yes, what were the results in terms of the birth prevalence of NTDs?

Results: As of 21 May 2022, 11 of 67 countries with mandatory fortification of wheat flour, maize flour, or rice that include folic acid in their fortification standards, have studies comparing NTDs before and after mandatory fortification was enacted. According to the World Bank, the countries are upper middle- or high-income countries. In each of the countries, from 1 to 7 studies have been published on the relationship between fortification and NTDs. The numerators in the studies include cases of spina bifida; spina bifida and anencephaly; and neural tube defects. The denominators in the study include live births; live births and still births; and live births, still births, and terminations. NTD data were reported as part of a birth defect surveillance system in at least one study in all of the countries. In every country, NTDs decreased from the pre- to the post-fortification period.

Discussion and Conclusions: Approximately 15% of countries that mandate fortification of a food with folic acid were found to have NTD impact data. All of these countries used birth defect surveillance systems to report NTD information in the pre- and post-fortification periods. In every country, NTDs decreased after fortification with folic acid. For countries that mandate fortification of a food with folic acid and which have birth defect surveillance systems there is an opportunity to use such systems to assess the performance of their fortification programs.

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Neural Tube Defects and Folic Acid Effects: Clarifying and Expanding the Phenotype

CT Mai[1], J Evans[2], Y Zhou[1], and CA Moore[1,3]
[1] *National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention, Atlanta, GA;* [2] *University of Manitoba, Winnipeg, Manitoba, CA;* [3] *Goldbelt Professional Services LLC, Atlanta, GA*

Email of corresponding author: cwm7@cdc.gov
Birth Defects Program on which the work is based: The abstract combines the work of two projects, one using data from multi-state birth defects programs (AZ, CA, GA MACDP, OK, SC, UT), and one using the Perinatal Health Care (PHC) Surveillance System in selected locations in northern and southern regions in China.

Background and Objectives: In 1992, the U.S. Public Health Service recommended that all women capable of becoming pregnant consume 400 µg of folic acid (FA) daily on an ongoing basis to reduce their risk for having a pregnancy affected by spina bifida (SB) and other neural tube defects (NTD). At this 30th year anniversary much has been learned about the preventive potential of FA for spina bifida and anencephaly as well as the change in SB phenotype in populations with FA fortification; however, questions remain. We recently investigated FA effects in two different populations – one with exposure through supplementation and another through fortification.

Methods: We examined all pregnancies with NTD status confirmation in selected locations in northern and southern regions of China for 1993-1996 in which the exposure was 400 micrograms of FA. We analyzed NTD prevalence by FA use status, NTD type, geographic region, and infant sex. FA use prevented occurrence of craniorachischisis and iniencephaly. FA use reduced the prevalence of SB by 78% in the north and 51% in the south. FA use reduced the prevalence of anencephaly and encephalocele by 85% and 50% respectively in the north, while it did not reduce the prevalence of these two NTDs in the south (Zhou et al., 2022).

Results: A second investigation sought to examine spina bifida lesion levels before and after FA fortification of enriched cereal grains in the US in 1998. Six active population-based birth defects programs provided data on spina bifida cases for 1992-1996 (pre-fortification) and 1999-2016 (post-fortification); programs contributed varying years of data on meningomyelocele, meningocele, spinal rachischisis, and spina bifida not otherwise specified. Case severity decreased 70% between the fortification periods. Overall spina bifida prevalence declined 23%; a statistically significant decrease in upper-level lesions occurred in the post-fortification compared to pre-fortification periods, while prevalence of lower-level lesions remained relatively similar (Mai et al., under journal review).

Discussion and Conclusions: These investigations help clarify and expand the phenotypes observed with FA exposure. The study in China is the first to show that FA prevents the entire spectrum of NTD types. The US study confirmed previous observations that severity of SB cases decreases with mandatory FA fortification. Both expand our knowledge of the significant public health benefits of periconceptional FA use.

Zika-virus-associated birth defects among live births in Costa Rica 2016-2018

A Benavides-Lara[1], MP Barboza-Arguello[1], M González-Elizondo[2], M Hernández-deMezerville[3], H Brenes-Chacón[3], M Ramírez-Rojas[4], C Ramírez-Hernández[5], N Arjona-Ortegón[6], S Godfred-Cato[7], D Valencia[7], CA Moore[7], A Soriano-Fallas[3]

[1] Centre of Congenital Disease Registry (CREC), Costa Rican Institute of Teaching and Research in Nutrition and Health (INCIENSA), Cartago, Costa Rica; [2] National Reference Centre for Virology (CNRV), Costa Rican Institute of Research and Education in Nutrition and Health (INCIENSA), Cartago, Costa Rica; [3] Hospital Nacional de Niños "Dr. Carlos Sáenz Herrera", Caja Costarricense de Seguro Social, San José, Costa Rica; [4] Health Surveillance Directorate, Ministry of Health of Costa Rica, San José, Costa Rica; [5] National Epidemiology Surveillance Department, Costa Rican Social Security Fund, San José, Costa Rica; [6] Child Health Sub-area, Costa Rican Social Security Fund, San José, Costa Rica; [7] Centers for Disease Control and Prevention, Atlanta, Georgia, USA.

Email or corresponding author: adriana.benavides@gmail.com

Birth Defects Program on which the work is based: Costa Rican Centre of Congenital Disease Registry - CREC

Background: In 2015, Zika virus (ZIKV) reached continental America, with an outbreak in Brazil. An increase in the number of children born with microcephaly and other central nervous system defects was evident since September 2015 in countries of the Americas where ZIKV was circulating. In Costa Rica, the first confirmed ZIKV case was detected in January 2016. In March 2016, the surveillance of birth defects attributable to zika (ZBD) was enhanced with the creation of a protocol that established a ZBD case definition and the follow-up of cases, based on the Costa Rican Centre of Congenital Diseases Registy (CREC) established since 1986, with a coverage of 96% of live births. The first child affected with ZBD was confirmed in May 2016. The objective of this study was to review and describe Costa Rica's enhanced surveillance data for ZBD and the clinical characteristics of confirmed and probable cases of ZBD among infants born in Costa Rica during March 2016-March 2018.

Methods: A descriptive analysis was conducted to characterize the ZBD outbreak among live births, based on data from the national ZBD surveillance system during March 2016-March 2018. The reported cases were reviewed to verify that they met the criteria for a suspected case, then they were classified as confirmed, probable, excluded or not classifiable by a multidisciplinary team in Costa Rica and experts from CDC, based on surveillance protocol definitions. Population-based prevalence (and 95% CI) of ZBD was calculated (confirmed and probable cases). Among infants with ZBD, distribution of specific birth defects and neurodevelopmental abnormalities were described. Province of origin of the mother, maternal history of exposure to ZIKV during pregnancy (associated symptoms and/or laboratory confirmation), and infant's ZIKV molecular and serologic results, were used to characterize infants with ZBD.

Results: Out of 373 cases reported, 243 met the suspected case criteria. ZBD prevalence was 15.3 per 100,000 births (95%CI=8.9-21.7): 11 confirmed cases (laboratory testing positive for ZIKV) and 11 probable cases (clinical criteria and mother with Zika during pregnancy) in 143,930 livebirths. Sixty-four percent of mothers of infants with ZBD had symptoms during first or second trimester of pregnancy; 23% of the mothers had positive ZIKV rRT-PCR during pregnancy. Ninety-one percent (20/22) of the cases had microcephaly, of which 9% (2) had postnatal onset; 82% (18/22) had at least one brain defect evident by brain images; 45% (9/20) had an eye anomaly; 9% had sensorineural deafness (2/22); and 95% (21/22) had at least one neurodevelopmental anomaly (82% with body tone anomalies and possible neurodevelopmental delay). Other frequent manifestations included multiple contractures, seizures, movement and swallowing anomalies. Infant mortality among ZBD cases was 13.6%.

Discussion and Conclusions: Microcephaly, which was monitored before the ZIKV outbreak in Costa Rica, showed an almost fourfold increase in prevalence after the ZIKV outbreak, from 4.2 per 10,000 to 15.5 per 10,000. Consistent with published case series from Brazil and from the US Zika Pregnancy and Infant Registry, microcephaly was the most frequent clinical finding among our cases, the majority classified as severe. Microcephaly is not the only congenital anomaly that should be monitored after ZIKV infection; other manifestations of ZBD are also important, such as brain and congenital eye defects and joint contractures as well as neurodevelopmental anomalies that could be evident during the first years of life. Conclusions: Population-based birth defects surveillance programs along with monitoring pregnant women with ZIKV disease provide an example of a complementary approach in ascertaining both exposures and outcomes to better monitor new and emerging threats during pregnancy and impact on infants.

A novel investigation of seropositivity to chlamydia among women prenatally diagnosed with and without gastroschisis.

ML Feldkamp[1], E Baum-Jones[2], S Krikov[1], E Enioutina[3], K Kamath[2]
[1] Division of Medical Genetics, Department of Pediatrics, University of Utah School of Medicine, Salt Lake City, UT, United States; [2] Serimmune, Inc., Goleta, CA, United States; [3] Division of Pediatric Clinical Pharmacology, Department of Pediatrics, University of Utah School of Medicine, Salt Lake City, UT, United States

Email of corresponding author: Marcia.Feldkamp@hsc.utah.edu
Birth Defects Program on which the work is based: Not applicable

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Background and Objectives: Gastroschisis likely results from the separation of the amnio-ectodermal junction during normal physiologic herniation of the midgut. Many risk factors have been associated with gastroschisis with multiple studies demonstrating an increased risk among women reporting periconceptional genitourinary (GU) infections. GU infections can be asymptomatic and many not evaluated in early pregnancy, making maternal questionnaires inadequate. The purpose of this study was to assess self-reported maternal risk factors, compare prevalence of seropositivity to 35 pathogens among women prenatally diagnosed with a fetal gastroschisis (cases) compared to women without fetal anomalies (controls) during their diagnostic or follow-up ultrasound, and compare Chlamydia trachomatis (CT) self-report to CT seropositivity.

Methods: Between 2011-2017, 54/58 (93%) case and 103/121 (85%) control women consented to participate: a trained study coordinator administered a questionnaire and obtained a blood sample. Blood samples were collected from 32 women at Planned Parenthood positive for CT (positive controls). Serum samples were analyzed by SERA, an agnostic multiplex serological assay developed by Serimmune, Inc.

Results: Compared to control women, case women were statistically significantly more likely to report younger age at sexual debut ($p=0.0005$), more sexual partners ($p=0.016$), younger age at conception ($p<0.0001$), being unmarried ($p<0.0001$), and changing partners between pregnancies ($p=0.0025$).
SERA revealed that samples (cases and controls) were seropositive to 19/35 pathogens tested. Seropositivity to CT was higher in cases (15%) compared to controls (7%) (OR 1.6 (95% confidence interval: 1.2, 2.2), highest among women <20 years of age (33%) compared to 0% controls. Among CT seropositive, self-report identified 33%, positive predictive value 56%. In summary, participation was high for pregnant case and control women, case women are younger at their sexual debut and more likely to engage in risky behaviors increasing their risk of exposure to pathogens, perhaps sexually transmitted.

Discussion and Conclusions: The SERA assay is a novel approach for evaluating subclinical infections in pregnancy that may impact the developing embryo. In the future, additional pathogens will be explored due to their potential to be subclinical infections. This approach requires collecting blood early in pregnancy, measuring for viral and bacterial pathogens, and questions on maternal exposures and sexual history at the time of prenatal diagnosis.

Neighborhood Deprivation During Pregnancy and Risk of Early and Late Stillbirths

FI Musfee[1], MD Politis[2], SG Young[1,3], R Cen[1], EF Magann[4], WN Nembhard[1,5]
[1]Arkansas Center for Birth Defects Research and Prevention, Department of Epidemiology, University of Arkansas for Medical Sciences, Little Rock, Arkansas; [2] Department of Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai, New York, New York; [3] Department of Environmental and Occupational Health, Fay W. Boozman College of Public Heath, University of Arkansas for Medical Sciences, Little Rock, Arkansas; [4] Department of Maternal Fetal Medicine, University of Arkansas for Medical Sciences, Little Rock, Arkansas; [5] Department of Pediatrics, University of Arkansas for Medical Sciences, Little Rock, Arkansas

Email of corresponding author: WNNembhard@uams.edu
Birth Defects Program on which the work is based: Arkansas Center for Birth Defects Research and Prevention

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Background and Objectives: During the past 30 years, stillbirths' rate in the United States showed increasing trends for early stillbirths (<28 weeks of gestation) and decreasing trends for late stillbirths (≥28 weeks of gestation). The factors behind these different trends are still unknown. One of the risk factors that was associated with an increase in the overall risk of stillbirths was living in socioeconomically deprived neighborhoods. However, whether living is such neighborhoods has different associations with early stillbirths compared to late stillbirths is still unknown. Therefore, we assessed associations between living in a deprived neighborhood on having early stillbirths versus late stillbirths compared to livebirths using a cohort of stillbirths and livebirths born in Arkansas from 2000 to 2014.

Methods: This case-control study included early stillbirths (N=1,780) and late stillbirths (N=1,701) cases ascertained from the Arkansas Reproductive Health Monitoring System, a statewide reproductive surveillance system, fetal death records; and birth certificate data for livebirth controls (≥37 completed weeks of gestation) (N=497,133) obtained from the Arkansas Department of Health (ADH). Area Deprivation Index (ADI), a measure of neighborhood deprivation, was derived from the American Community Survey and categorized into quartiles (quartile 4 represented the most deprived neighborhoods). Odds ratios (OR) and 95% confidence intervals (CI) were calculated from a multinomial logistic regression model where the associations of ADI on having early versus late stillbirths where compared to livebirths and adjusted for infant sex, maternal race/ethnicity, plurality, gravidity, parity, and maternal age. A Wald test (P<0.05) was used to compare early to late stillbirths' multinomial odds ratios.

Results: Compared to women with late stillbirths, women with early stillbirths were 30% more likely to be non-Hispanic Black, 33% less likely to be Hispanic, and about 3 times more likely to have multiple gestations. Among women living in the most deprived neighborhoods (i.e., ADI quartile 4), the odds of having an early stillbirth was 2.41 (OR early stillbirth: 2.41, 95% CI: 1.79-3.23) and a late stillbirth was 1.85 (OR late stillbirth: 1.85, 95%CI: 1.39-2.46) compared to women who had a livebirth. The increase in the odds of early stillbirths compared to that of late stillbirths was statistically insignificant (Wald test P=0.35)

Discussion and Conclusions: Living in deprived neighborhoods equally increased the risk for having an early or a late stillbirth; however, non-Hispanic Black women and women with multiple gestations were more likely to have an early stillbirth than a late stillbirth. Further research is needed to replicate these findings and to investigate for additional factors that may contribute to the differences in early versus late stillbirth trends.

Hypothyroidism in patients with Down Syndrome: prevalence and association with congenital heart defects

F Gorini, A Coi, A Pierini, M Santoro
Unit of Epidemiology of Rare Diseases and Congenital Anomalies, Institute of Clinical Physiology; National Research Council, Pisa, Italy

Email of corresponding author: fgorini@ifc.cnr.it
Birth Defects Program on which the work is based: Registry of Congenital Defects of Tuscany

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Background and Objectives: Down syndrome (DS) is the most common chromosomal abnormality in live born infants and congenital heart defect (CHD) is frequently associated. Thyroid disorders (congenital hypothyroidism, autoimmune thyroid disease, overt and subclinical hypothyroidism, hyperthyroidism) are commonly associated with DS, with an increased frequency compared to the general population. This population-based study aimed at estimating the prevalence of both congenital and acquired hypothyroidisms in children with DS, also exploring their association with CHD in DS patients

Methods: In this retrospective study, the population included all children born with DS in the period 2003-2017 and residing in Tuscany (Italy). DS cases were selected from the Registry of Congenital Defects of Tuscany (RCDT) and the Registry of Rare Diseases of Tuscany. The information on the association with CHD was extracted from RCDT and the hospital discharge database (HDD). Diagnoses of congenital and overt hypothyroidism were retrieved from both registries and the regional health care databases (i.e. HDD, prescriptions, exemption from co-payment). Overt hypothyroidism was defined as a disorder without a diagnosis of congenital hypothyroidism and treated with levothyroxine. Prevalence of congenital and overt hypothyroidism was estimated in children with DS. Logistic regression was used to assess the strength of the association of congenital and overt hypothyroidism with CHD in DS patients, adjusting for sex,length of gestation and maternal education.

Results: A total of 228 children with DS (50.4% males) were included in this study. Congenital and overt hypothyroidism were diagnosed in 32 (prevalence 14.0%, 95%CI 9.6%-19.8%)%) and 35 children (prevalence 15.3%, 95%CI 10.7%-21.3%), respectively, with no significant difference by sex. The presence of congenital hypothyroidism significantly increased the prevalence of CHD (OR=2.69, 95%CI: 1.24-5.83, p=0.012), and a weak evidence of association was also observed after adjusting for sex, length of gestation and maternal education (OR=2.17, 95%CI 0.90-5.19, p=0.083). As regards overt hypothyroidism, an association was found only with ventricular septal defects (OR=2.52, 95%CI 1.09-5.97, p=0.035).

Discussion and Conclusions: In this population-based study we estimated the risk of hypothyroidism – both congenital and overt – in children with DS. Our results confirmed the much higher prevalence of both conditions in DS compared to the general population. Children with DS and congenital hypothyroidism have a higher risk of CHD than patients with DS but without congenital hypothyroidism.

Neonates infected and/or born to mothers with SARS-CoV-2 during pregnancy or peripartum, hospitalized in French level 3 neonatal intensive care units (NICUs): a reactive national surveillance system

J Boudet-Berquier[1], C Lecoffre-Bernard[1], A Doncarli[1], A Ung[1], E Gomes[1], G Deschamps[1], J Naud[1], E Kermorvant[2], A Beuchee[3], A Gallay[1], N Regnault[1], JC Rozé[3]
[1] *Santé publique France, Paris, France;* [2] *AP-HP.Centre - Université Paris Cité, Department of Neonatal Medicine, Hôpital Necker-Enfants malades, Paris, France;* [3] *University of Rennes, CHU Rennes, Inserm, LTSI-UMR 1099, Rennes, France;* [4] *Department of Neonatology. Nantes University, Nantes, France*

Email of corresponding author: Julie.BOUDET-BERQUIER2@santepubliquefrance.fr
Birth Defects Program on which the work is based: Not applicable

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Background and Objectives: Between April and August 2021, Santé Publique France, the French Public Health Agency, received several reports of serious maternal and neonatal health complications following maternal SARS-CoV-2 infection. In the absence of a reactive surveillance system to document the impact of maternal or neonatal SARS-CoV-2 infection, Santé Publique France developed and implemented, in collaboration with the French Society of Neonatology, an ad hoc national surveillance system. It was deployed in French level 3 NICUs from November 2021. The objectives were to describe during the pandemic the changes in the proportion of bed occupied in these services by neonates infected with SARS-CoV-2 and/or born to mothers infected with SARS-CoV-2 during pregnancy or peripartum and to document the characteristics of these neonates, in particular regarding infection and parental vaccination status. We present here the results of the data collected during the first 4 months of this surveillance.

Methods: Clinicians on each participating NICU services reported weekly, via a dedicated online application, the number and characteristics of neonates infected and/or born to a mother infected with SARS-CoV-2, hospitalized each Monday. To be included, newborns had to a) be less than 29 days old for term newborns, or less than 45 weeks after the first day of the last menstrual period for preterm infants b) be infected with SARS-CoV-2 (with biological confirmation of infection) or be born to a mother infected during pregnancy or peripartum (28 days after birth or less). The clinicians documented Covid-19 vaccination status of the mothers, at the time of their child's hospitalization. The proportion of bed occupied by these neonates was estimated by dividing the number of beds occupied by neonates meeting the inclusion criteria, by the total number of beds occupied in critical care services on Monday.

Results: Of the 67 level 3 NICUs in France, 65 agreed to participate. Between November 29, 2021 and March 21, 2022, the average participation rate was 59.0%. After an increase over the first twelve weeks of monitoring (1.8% on 11/29/2021 to 15.1% on 02/14/2022), the proportion of beds occupied in NICUs on Monday by a newborn infected and/or born to mothers with SARS-CoV-2 decreased by almost six points (9.6% on March 21, 2022). As of 3/21/2022, 423 newborns had been included in this surveillance. Only 9.5% were themselves infected by the virus, 46.1% were not infected, 39.2% did not have a PCR test or serology performed. More than 95% of the mothers were infected during pregnancy or peripartum and among them, 14.8% were hospitalized in an adult intensive care unit. Data on vaccination status was provided for 69.5% of mothers. Among them, 64.5% had not received any vaccines against COVID at all, 5.0% had an incomplete schedule, and 30.5% had received at least two doses.

Discussion and Conclusions: This surveillance system highlighted the increase in proportion of bed occupied in NICUs by neonates infected with and/or born to mothers infected with SARS-CoV-2 during pregnancy or peripartum, during the period of the fourth and fifth waves with intense virus circulation in France. These elements, as well as information on the characteristics of the newborns and the vaccination status of the mothers were regularly transmitted to the French Ministry of Health. Indeed, they were essentials to support prevention measures, such as vaccination of pregnant women, in order to reduce unfavourable pregnancy outcomes for the mothers and their newborns.

International Clearinghouse for Birth Defects
Surveillance and Research

48th Annual Meeting of the International Clearinghouse for Birth Defects Surveillance and Research (ICBDSR)

CONGRESS ON CONGENITAL HEART DEFECTS: FROM PRENATAL DIAGNOSIS TO ADULTHOOD

September 20th , 2022

Sala 20 Maggio 2012- Viale della Fiera 8, Bologna

Organized by IMER Registry

Scientific Coordinators :
Guido Cocchi, Andrea Donti, Gaetano Domenico Gargiulo
Alma Mater, University of Bologna, Italy

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Società Italiana di Pediatria

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Società Italiana Malattie Genetiche Pediatriche e Disabilità Congenite

PROGRAM

9:00 - 9:20	**Opening Ceremony**
	Maurizia Rolli, Emilia Romagna Region, Italy
	Marco Seri, Bologna, Italy
	Stefano Volpato, Ferrara, Italy
	Boris Groisman, Buenos Aires , Argentina
9:20-9:30	**Introduction** **Chair: Marco Seri**, Bologna, Italy Why my child? Can anything be done? **Guido Cocchi,** *Bologna, Italy*
9:30 - 10:00	**Keynote Lecture** **Chair: Marco Seri**, Bologna, Italy Congenital heart defects: a lifespan and population perspective. **Lorenzo D. Botto**, *Salt Lake City, USA*
10:00-11:00	**The Prenatal Diagnosis: impact and outcome**
	Chair: Luigi Tommaso Corvaglia, *Bologna, Italy*
	The prenatal diagnosis of Congenital Heart Disease: Recommendations for prenatal screening. **Gianluigi Pilu**, *Bologna, Italy*
	The prenatal diagnosis of Congenital Heart Disease: Impact and outcome**.** **Daniela Prandstraller**, *AUSL Romagna, Italy*
	Genetics of heart defects in prenatal diagnosis. **Claudio Graziano**, *AUSL Romagna, Italy*
	Prenatal counseling and perinatal assistance **Chiara Locatelli**, *Bologna, Italy*
11:00-11:30	Discussion
11:30-11:45	*Break*
11:45 - 12:45	**Diagnosis and therapeutic approaches to the newborn with Congenital Heart Defects**
	Chair: Gaetano Domenico Gargiulo, Bologna, Italy
	Cardiogenetic approach in neonates with Congenital Heart Defects. Does it improve clinical outcome? **Anwar Baban,** *Rome, Italy*
	Management of neonates with Congenital Heart Defects: challenging condition for paediatric cardiologist **Luca Ragni**, *Bologna, Italy*
	Surgical treatment of neonates with Congenital Heart Defects: single gateway to the future **Emanuela Angeli,** *Bologna, Italy*
12:45 - 13:15	Discussion
13:15-14:15	*Light Lunch*

14:15-15:30	**Follow-up, Surveillance, and Outcome**
	Chair: Andrea Donti, Bologna, Italy
	Congenital Heart Disease: Left and Right sided Heart Obstruction. **Nadia Assanta,** *Massa Carrara, Italy*
	Congenital Disease: Single Ventricular Physiology **Giulio Calcagni,** *Rome, Italy*
	Evaluation and management of the child and adolescent with heart disease. **Giovanni Battista Calabri**, *Florence, Italy*
	Surgical outcome and mortality in children with congenital heart disease across Europe. **Mads Damkjaer,** *Kolding, Denmark*
15:30-16:00	Discussion
16:00-16:30	*Break*
16:30-17:30	**Heart Defects and Adulthood**
	Chair: Marco Bonvicini, Bologna, Italy
	The lifelong journey of adults with congenital heart disease. **Gabriele Egedy Assenza,** *Bologna, Italy*
	Living with a congenital heart disease: psychological aspects in adulthood. **Enrica Longo,** *Bologna, Italy*
	Little Big Hearts: a fantastic reality inside the Hospital **Patrizia Romualdi**, *Bologna, Italy*
	My (extra)ordinary life: from surgical operations to the transplant Emanuele Galli, *Bologna, Italy*
17:30-18:00	Discussion
18:00	*Closing of the Congress*

FACULTY

ANGELI EMANUELA, Pediatric and Adult Congenital Cardiac Surgeon, Pediatric Cardiac Surgery and Adult Congenital Heart Disease Program, Department of Cardio-Thoracic and Vascular Medicine, IRCCS Azienda Ospedaliero-Universitaria of Bologna, Italy

ASSANTA NADIA, Director UO Medical and Surgical Heart Disease of Childhood and Congenital Adult. Heart Hospital, G. Monasterio Tuscan Foundation, Massa , Italy

BABAN ANWAR, Coordinator of the Center of Cardiogenetic, Cardio-Surgery Department, IRCCS Pediatric Hospital Bambin Gesù, Rome, Italy

BONVICINI MARCO, Professor Alma Mater, Paediatric Cardiology and Heart Surgery Department, University of Bologna, Italy

BOTTO LORENZO D, International Center on Birth Defects (ICBD), Division of Medical Genetics, Department of Pediatrics, University of Utah, Salt Lake City, UT, USA

CALABRI GIOVANNI BATTISTA, Paediatric Cardiology Unit “Anna Meyer” University Hospital, Florence

CALCAGNI GIULIO, Department of Cardiac Surgery, Cardiology, Heart and Lung Transplantation. Bambino Gesu' Children's Hospital, IRCCS, Rome, Italy

COCCHI GUIDO, Professor Alma Mater, Maternal & Child Department, Center of Birth Defects and Rare Disease, University of Bologna, Italy

CORVAGLIA LUIGI TOMMASO, Full Professor of Pediatrics, Medical and Surgical Sciences Department, University of Bologna. Director of Neonatal Intensive Care Unit and Neonatology, IRCCS A.O.U. S.Orsola-Malpighi, Bologna, Italy

DAMKJAER MADS, Department of Paediatrics and Adolescent Medicine, Lillebaelt Hospital, University Hospital of Southern Denmark, Kolding, Denmark

DONTI ANDREA, Head of Pediatric Cardiology and Adult Congenital Heart Disease Program, IRCCS Azienda Ospedaliero-Universitaria of Bologna, Italy

EGIDY ASSENZA GABRIELE, Pediatric Cardiology and Adult Congenital Heart Disease Program. Department of Cardio-Thoracic and Vascular Medicine. IRCCS Azienda Ospedaliero-Universitaria of Bologna, Italy

GALLI EMANUELE, GUCH (Grown Up Congenital Heart) waiting for transplant. Investigative Agency Discovery, Bologna, Italy

GARGIULO GAETANO DOMENICO, Full professor of Cardiac Surgery, Head of Department of Cardiac, Thoracic and Vascular Medicine, Head of Pediatric Cardiac Surgery and Adult Congenital Heart Disease Program, IRCCS AziendaOspedaliero-Universitaria of Bologna, Italy

GRAZIANO CLAUDIO, Director of Medical Genetics, AUSL Romagna, Cesena, Italy

GROISMAN BORIS, Chair of ICBDSR, Ministerio de Salud, Buenos Aires, Argentina

LOCATELLI CHIARA, Ambulatory Congenital Malformation and Rare Disease, Neonatal Intensive Care Unit and Neonatology. IRCCS A.O.U. S. Orsola-Malpighi, Bologna, Italy

LONGO ENRICA, Psychologist of Little Big Hearts Association, Unit of Pediatric Cardiology and Cardiosurgery, S.Orsola-Malpighi, Bologna, Italy

PILU GIANLUIGI, Full Professor of Obstetric and Gynaecology. University of Bologna. Director of Obstetrics. IRCCS A.O.U. S.Orsola-Malpighi, Bologna, Italy

PRANDSTRALLER DANIELA, Paediatric Cardiology, AUSL Romagna, Italy

RAGNI LUCA, Heart Cardiological Intensive Care Unit, Department of Cardio-Thoracic and Vascular Medicine. IRCCS Azienda Ospedaliera-Universitaria of Bologna, Italy

ROMUALDI PATRIZIA, Vice President Association Little Big Hearts, Bologna , Italy

ROLLI MAURIZIA, Director of Hospital Management Department, Emilia-Romagna Region, Italy

SERI MARCO, Full Professor of Medical Genetics, Director of O.U. of Medical Genetics, Director of Maternal & Child Department, S. Orsola-Malpighi Hospital, University of Bologna , Italy

VOLPATO STEFANO, Full Professor of Internal Medicine, Department of Medical Science, University of Ferrara, Director IMER Registry, Italy

WHY MY CHILD? CAN ANYTHING BE DONE?

Guido Cocchi
Emilia Romagna Registry (IMER)
Maternal & Child Department, Center of Birth Defects and Rare Disease,
University of Bologna, Italy

Congenital heart defects (CHDs) are the most common types of birth defects, and babies born with these conditions are living longer and healthier lives. CHDs affect approximately 1 in 100 births. About 1 in 4 babies with CHD, or about 1 in 500 births, have a critical congenital heart defect (CCHD). Infants with CCHD generally require urgent and significant medical and surgical care to ensure survival. They are also associated with lifelong morbidities and, for healthcare systems, some of the leading cost-drivers for pediatric in-hospital care. Prenatal detection of CHD depends on several factors, such as technology (the availability of adequate equipment), the skill level of the sonographer (which require more experience than the standard prenatal anatomic scan) as well as screening policies and access to prenatal screening services. In-utero transport has become an indispensable component of regionalized perinatal care and represents the gold standard of care that should be offered to all newborns at risk of intensive perinatal care. In close cooperation with cardiologist and obstetrician, the neonatologist, specifically in a Hub Center, is directly involved in perinatal assistance of the newborn and the ongoing communication with the parents.

The relationship with parents, particularly with the mother, is not only aimed at giving clinical information about the clinical approach to the child affected by CHD, but to identify their emotional and psychological needs as well. Many of the questions asked pertain to why this has happened to their child, and above all what, if anything, can be done to resolve the defect itself. Parents have a different perception of their child's CHD depending on their cultural background, but all parents experience the moment of diagnosis as the most difficult of their life.

This Symposium seeks to establish the most recent know-how regarding diagnosis, hereditary condition, prognosis and the life expectancy of the child affected by CHD. We will confront and discuss this topic starting with the answer to what is often the first question "Why has this happened to my child?". We know that about 75% of the CHDs are isolated defects. Etiological reasons for many of them have hitherto been difficult to identify. The remining 25% are other pathologies: 11% of which are Multiple Congenital Anomalies, 9% are related to Chromosomal Abnormalities and in 4% a well-defined etiological condition is recognized (IMER data). With regard to the impact on survival and care needs, CHDs are a leading cause of birth defect-associated infant illness and death. Infant deaths due to CHDs occur in the neonatal period (less than 28 days). Survival of infants with CHDs depends on how severe the defect is, when it is diagnosed and how it is treated. About 97% of babies born with a non-critical CHD are expected to survive to one year of age and about 95% to 18 years of age. Given the above, it can be said that though the population of people with CHDs is increasing, survival rates and medical care for infants with CCHDs are improving as well.

CONGENITAL HEART DEFECTS: A LIFESPAN AND POPULATION PERSPECTIVE

Lorenzo D. Botto
International Center on Birth Defects (ICBD)
Division of Medical Genetics, Department of Pediatrics
University of Utah, Salt Lake City, UT, USA

Congenital heart disease (CHD) is common, costly, and critical. Approximately half of all infant deaths due to congenital anomalies are associated with CHD or neural tube defects. As infant mortality improves due to better infection control and peripartum care, congenital anomalies are becoming a key driver of pediatric survival and health.
Improving CHD prevention and care globally will play a significant role toward key goals such as United Nation's sustainable development goals (SDGs) of good health and well-being (SDG 3) and reduced inequalities (SDG 10).

This review addresses two questions: how can we reinterpret and reframe available data on CHD to spur action in prevention and care? How can we re-engineer how we currently track CHD in populations to efficiently generate new data to assess successes and detect gaps in prevention and care? Answering these questions requires understanding the causal chain of disease, from cause to CHD occurrence to health outcomes. This perspective provides a logical basis for two innovations. First, through partnerships between clinical and public health systems, implement an integrated "triple surveillance and action" (3SA). Second, develop a data-driven message that reframes epidemiologic and clinical data in terms of incentives for action, evidence for change, and strategies for population-wide impact.

In the case of CHD, what does implementing triple surveillance and action actually mean? One answer is tracking and intervening concurrently on all three elements of the causal chain: causes ->disease occurrence ->, health outcomes. Too often the focus rests almost exclusively on disease occurrence (e.g., measuring prevalence at birth), with little follow up to assess outcomes, and limited risk factor profiling of the underlying population (e.g., frequency of maternal diabetes). Crucially, to be maximally effective and equitable, tracking and intervention ought to population-wide and through the lifespan. This approach requires systems to track risk factors, disease prevalence, and morbidity and mortality on a population-basis (rather than only in hospital cohorts or individuals able to access tertiary care centers) and through adolescence and adulthood (rather than only in babies or children). This broader perspective is increasingly appreciated, as reflected by important data currently emerging of the lifespan impact of CHD Clinicians and epidemiologists can be strong advocates for this perspective, which has the potential of in improving prevention and care both for their patients and throughout the population .

PRENATAL DIAGNOSIS OF CONGENITAL HEART DISEASE: RECOMMENDATION FOR PRENATAL SCREENING

Gianluigi Pilu
Obstetric Unit, IRCCS Azienda Ospedaliero-Universitaria di Bologna
Department of Medical and Surgical Sciences, University of Bologna, Italy

Cardiac anomalies are the most frequent congenital malformations with an overall prevalence in the range of 7 per 1000 births. The incidence is much increased in spontaneous abortions.

There is a consensus on the need to perform a basic sonographic examination of cardiac structures as a part of the evaluation of fetal anatomy that is recommended in all pregnancies at mid gestation. The examination should include the assessment of the situs, four chamber view and cardiac outflows. The yield of anomalies that can be diagnosed is not clear. From a theoretical point of view, most cardiac malformation symptomatic in the neonatal period could be identified.

Practically, epidemiologic surveys conducted in different European areas demonstrate great variations.

PRENATAL DIAGNOSIS OF CONGENITAL HEART DISEASE: IMPACT AND OUTCOME

Daniela Prandstraller
Paediatric Cardiology, AUSL Romagna, Italy

The main gold standard of prenatal diagnosis is to optimize fetal, perinatal and neonatal care of patients (pts) with severe Congenital Heart Defects (CHD) in order to reduce morbidity and mortality.
The true impact of prenatal diagnosis on neonatal outcome of CHD is a complex and still controversial problem. Some Authors report a reduced survival in the first year of life, probably due to the highest incidence of severe and complex diseases in this cohort of pts. The prenatal detection of cardiac malformations may lead to a high rate of interruption of pregnancy and a reduced birth incidence of complex and severe CHD, but this is not universal and it's highly dependent on different Centers, parents geographic origin and counselling.
Access to prenatal diagnosis on the other side doesn't seem to be influenced by socioeconomical level, at least in Western Countries. Prenatal diagnosis is now widely diffused and currently offered to the majority of pregnant women but a great number of CHD are still missed. What is the true percentage of severe CHD not being detected at prenatal scan? Why there are so many differences in different Centers? A part from incidental factors (maternal BMI, fetal position, etc.), two elements are essential for a correct evaluation of fetal heart in the second trimester:
- The first one is an adequate quality of images and a complete scan, exploring all the known projections (four chambers, 3 vessels, right and left outflow tracts both fetal and aortic arches).
- The second one is the ability of sonographers, defined by skill, type of training an volume of examinations per year.
Optimizing these two points, the prenatal detection rate of CHD could be raised from 50 to 80%.
The more precise the diagnosis the more correct the counselling and the more effective the treatment. Nonetheless also the better outcome of CHD prenatally detected is unclear although there are evidence-based data supporting reduced brain damage, reduced multiorgan failure and a reduced perioperative stay in intensive care unit. Moreover a prenatal evaluation of possible clinical problems is of great help for the multidisciplinary team involved in the care of newborns with CHD: obstetricians, neonatologists, anesthesiologists, pediatric cardiologists and surgeons and leads to the most effective collaboration.
As far as echocardiographic evaluation is concerned, there are some major problems that we face in our everyday medical practice:
- coarctation of the aorta and the evaluation of the aortic arch: it's always possible a correct diagnosis?
-borderline ventricles: this is often a dramatic problem in left ventricular outflow tracts defects, Atrio-Ventricular defects and Double Outlet Right Ventricle (DORV). Biventricular correction or univentricular palliation?
- right aortic arch, left superior vena cava (LSVC) and other "minor" markers: when a genetic syndrome has to be suspected? Moreover: genetic tests always help or often hamper a punctual counselling in uncertain cases?
- nowadays interventional fetal procedures are becoming quite common for aortic and pulmonary stenosis (valvuloplasty) and for the treatment of restrictive Patent foramen Ovale in Hypoplastic Left Heart Syndrome cases. How to define risks, advantages and timing in suitable cases?
At present these are the biggest challenges of prenatal cardiology. We hope that new techniques together with a greater experience and a better knowledge could assure in the near future better results and a more precise counselling.

GENETICS OF HEART DEFECTS IN PRENATAL DIAGNOSIS

Claudio Graziano
UO Genetica Medica Romagna, Cesena, Italy

Cardiovascular anomalies are among the most common birth defects, occurring in about 0.7% of live births. Non-syndromic heart defects usually recognize a multifactorial origin, although the introduction of next generation sequencing facilitated the discovery of monogenic conditions in at least a subset of these cases. Syndromic heart defects have a heterogenous etiology, from common chromosome aneuploidies (e.g. Down syndrome) to copy number variants (CNVs, 22q.11.2 deletion being the most common) and single gene disorders.

The prenatal suspicion of a heart defect should prompt further investigation, including genetic counseling and molecular tests: identifying the genetic defect may help to define the prognosis, as additional structural malformations are not always identified prenatally. The knowledge of an underlying disease may help to predict outcome, complications, and the possible involvement of other organs or systems.

At out center, genetic counseling and invasive prenatal sampling (chorionic villus or amniotic fluid) are utinely offered when isolated or syndromic heart defects are detected. Quantitative fluorescent polymerase chain reaction (QF-PCR) is performed to rapidly detect common aneuploidies, alongside standard karyotype. If QF-PCR is normal, a search for possible CNVs through chromosomal microarray analysis (CMA) is immediately performed. In seven months (September 2021-March 2022), 42 CMA were requested from our center due to fetal malformations. Among them, 8 fetuses (19%) had heart defects: one was syndromic (right aortic arch and renal malformations), one had an additional soft marker (transposition of the great arteries and hyperechogenic bowel), six were isolated.

One case had a definite diagnosis: the fetus with heart defect and renal malformation had a typical de novo 22q11.2 deletion. Another one, with isolated tetralogy of Fallot, had an atypical small 22q11.2 deletion, with a breakpoint not including but very close to TBX1; the deletion was inherited by the mother, who is healthy (no heart defect or other morbidities indicative of 22q11.2 del syndrome). CMA was normal in the remaining six cases, but one case with an atypical cardiac fibroma underwent sequencing analysis for tuberous sclerosis complex and a TSC2 mutation was identified.

In summary, CMA represents a valuable tool for investigating the causes of fetal heart defects. The presence of a CNV can be diagnostic and give clear information on post-natal outcomes. Exome sequencing on fetal DNA may improve the diagnostic yield and will likely be implemented in the near future.

PRENATAL COUNSELING AND PERINATAL ASSISTANCE

Chiara Locatelli
Ambulatory Congenital Malformation and Rare Disease
Neonatal Intensive Care Unit and Neonatology
IRCCS A.O.U. S.Orsola-Malpighi, Bologna, Italy

Congenital heart disease(CHD) affects nine per 1,000 live births and represents the most common congenital anomaly in newborns. Antenatal detection of CHD may improve survival postnatally. The possible association of genetic, chromosomal, or syndromic anomalies should be discussed and how these may affect management and outcomes of the cardiac disease. With improved ability to diagnose CDH before birth, the field of prenatal counseling has expanded. Prenatal diagnosis of CDH is extremely stressful and traumatic for the family, the prognosis may be uncertain, which further complicates decision-making. Different associations and societies have published recommendations for parental counseling after fetal diagnosis, however, in view of this complexity, relatively little research has focused specifically on providing the most effective counseling techniques. Care for these families needs a multidisciplinary team. Delivery planning is an important component of the counseling. Fetal cardiologists and maternal fetal medicine specialists work collaboratively as caregivers to the mother and fetus with heart disease.

Delivery at a tertiary care facility with access to pediatric cardiac care is recommended for ductal-dependent lesions and any heart defect that is expected to require neonatal intervention. Counseling should be given in close cooperation with the obstetrical team to provide consistent information to the parents and optimal care for the fetus.

Parents should be counseled on what to expect for delivery room management, as it differs from a normal delivery experience. Parents should be told whether they will be able to hold their new baby and how much time they may have before the infant is transferred from the delivery room. Discussion should include which unit the baby is expected to be admitted, whether nursery (for defects without anticipated significant hemodynamic or clinical effects) or an intensive care unit. Offering parents a tour of these units allows them an opportunity to visualize where their care and their infant‘s care will take place and may help lessen anxiety about what to expect.Parents should know that modifications to the fetal diagnosis may be made after birth and that surgical plans may change depending on postnatal findings. Nevertheless, the anticipated type of cardiac intervention should be discussed as well as expected hospital course and length of stay.

Feeding issues should be discussed, including whether the infant will be allowed to feed pre-operatively, and the mother should be counseled that at least initially, she may have to pump breast milk instead of directly breastfeeding. Helping the parents understand what they might expect when going home will help them prepare for childcare and work decisions.

The challenge to physicians is to assess the family‘s desire for information, provide support, and collaborate with them in the decision-making process. Proper communication to parents enables them to establish a good parent-child and doctor-parent relationship. Several authors have examined interactions between physician and families in the setting of CHD, some studies document that the parents are often more concerned with the plan for the pregnancy and perinatal care than the details about the anomaly. From the neonatologist, the parents desire information about the care of the infant at delivery and the expected NICU courseinformations that they had not heard from other physicians. The neonatologist can inform parents about the infant as a whole, a unique perspective that other subspecialists may not provide. The family wants to know about the biomedical information relevant to their infant‘s care, but they also want to know about the human aspects of that care. Families were relieved to learn about the planned care for their infant as a person, not just about as an anomaly. Parents were reassured to see NICU staff providing both competent medical care and nurturing emotional and developmental care for infants. During counselling it is important to provide parents with contact details of local support groups, parents' associations and to offer them the opportunity, if they wish, to meet families who are already raising a child with CDH, so that they can hear first-hand experience.

Parental counseling for fetal heart defects is multidimensional, and requires significant expertise.

CARDIOGENETIC APPROACH IN NEONATES WITH CHDs. DOES IT IMPROVE CLINICAL OUTCOME?

Anwar Baban
Cardiogenetic Centre, Pediatric Cardiac Surgery
Cardiology, Heart and Lung Transplant Department
Bambino Gesù Children Hospital & Research Institute IRCCS Rome, Italy

Congenital heart diseases (CHDs) represent about 0.8% to 1% livebirths. CHDs are caused by several mechanisms where most are multifactorial. Most CHDs are isolated with no evidence of other affected organ systems. However systemic involvement is to be excluded. On the basis of specific CHDs subgroup, the probability of having an isolated or syndromic CHD can vary greatly. For example, TGA o DORV are often isolated while interruption of aortic arch or complete atrioventricular canal can be challenging and often represent a sign within a complex multisystemic context.

CHDs are caused by several mechanisms where most are multifactorial. The origin of CHDs is majorly unknown. However, a classification according to causative factor can be observed in literature. CHDs in chromosomal anomalies can reach 8-10% of all CHDs. In approximately 30% a monogenic/digenic cause is reported. Genetic heterogeneity including incomplete penetrance and variable expressivity is the rule in CHDs. Unfortunately, the “traditional /old” vision related to genetic approach in CHD is often related either to the world of syndromology or to that of molecular detection rate.

In this specific presentation, we would like to shed the light on the approach that is established on multidisciplinary basis with the collaboration of clinical genetic / rare diseases unit within the management process of CHDs and what it can add to neonatologists, pediatricians, pediatric cardiologists, cardiac surgeons and molecular scientists involved in this field.

More specifically, in this talk we shall share the following items:

Potential progressive aspects in cardiac phenotype due to genetically determined background. Genes known to be causative for CHD) can also predispose to cardiomyopathies (CMPs) or serious arrhythmic events. Neonatologists and pediatric cardiologist can have useful toll in recognizing underestimated progressive cardiac events in some genetically determined CHDs. Risk stratification is required in certain CHDs.

Looking specifically for red flags in specific subgroups of CHDs can be of help in preventing both events on the affected individual and family members, include familial CHDs, progressive arrhythmic events, and myocardial dysfunction unexplained by hemodynamic parameters.

Systematic multisystemic approach can be vital in certain conditions in preventing complications such as immunological screening, prophylactic antibiotics, and immunization program in heterotaxy children.

The identification of etiologic factors can be an example of conducting a personalized medicine care and tailored patient management.

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SURGICAL TREATMENT OF NEONATES WITH CONGENITAL HEART DEFECTS: SINGLE GATEWAY TO THE FUTURE

Emanuela Angeli
Pediatric Cardiac Surgery and Adult Congenital Heart Disease Program
Department of Cardio-Thoracic and Vascular Medicine
IRCCS Azienda Ospedaliero-Universitaria of Bologna, Italy

Luca Ragni
Heart Cardiological Intensive Care Unit
Department of Cardio-Thoracic and Vascular Medicine
IRCCS Azienda Ospedaliera-Universitaria of Bologna, Italy

Congenital heart diseases are the most common newborns malformations with an incidence of 8 out of 1000 live births. One out of three of these newborns has critical lesions, characterized by duct-dependence of the systemic circulation or pulmonary circulation, that require cardiac surgery during the first days of life. Low birth weight and prematurity, associated with functional immaturity, make these patients more vulnerable and still considered with important risk factors for open heart surgery. Nevertheless, the continuous progress in prenatal diagnosis, interventional procedures at birth, neonatal cardiac surgery, perioperative intensive care have significantly improved the outcome of these newborns undergoing cardiac surgery.

Surely cardiac surgery, especially in case of surgical procedures to be performed with extracorporeal circulation, has a complication rate that is higher in newborns than in older children and the related risks increase in proportion to the reduction of the body weight.

However, over the years, the progress also in the field of myocardial and cerebral perfusion has led to perform always earlier a highly complex neonatal cardiac surgery as in the case of the surgical treatment of transpositions of the great arteries, the reconstruction of the aortic arch in cases of hypoplasia and the Norwood procedure for the treatment of hypoplastic left heart syndrome with encouraging results.

Surely, the improvement in the outcome of these newborns depends not only on the surgical technique adopted, but also on other factors related to the specific characteristics of each individual patient and the postoperative management of these very delicate newborns.
Therefore, this complex and high-risk population needs to be managed by a highly specialized multidisciplinary team for complex neonatal and cardiac care that participates in surgical decision making and perioperative management of complications.

FOLLOW-UP SURVEILLANCE AND OUTCOME
CONGENITAL HEART DISEASE: LEFT AND RIGHT SIDED HEART OBSTRUCTION

Nadia Assanta
Director UO Medical and Surgical Heart Disease of Childhood and Congenital Adult
Heart Hospital, G. Monasterio Tuscan Foundation, Massa, Italy

Congenital Heart Disease (CHD) is among the most frequent malformation. Serious congenital heart defects usually are noticed soon after birth or during the first few months of life. CHD often give early symptoms and require early treatment. More complex CHD may need several procedures over a period of several years. Other CHD are simple and don't need treatment but only an adequate follow up.
Signs and symptoms of congenital heart defects in children may include:

- Easily becoming short of breath during exercise or activity
- Easily tiring during exercise or activity
- Fainting during exercise or activity
- Swelling of the eyelids in the hands and ankles
- Hepatomegaly

Potential complications of unknown CHD in children include:

- Congestive heart failure: Signs of congestive heart failure include rapid breathing, often with gasping breaths, and poor weight gain.
- Heart infections: CHD can increase the risk of endocarditis.
- Arrhythmias
- Slower growth and development delays

Obstructions of the right and left heart are a wide spectrum of abnormalities that can give symptoms in the first days of life or remain asymptomatic for a long time. In daily practice the paediatrician may be faced with a child / adolescent with congenital heart disease operated, multi-operated or in native history. The most frequent obstructions of the left heart concern the aortic valve (often on bicuspid aortic valve) and aortic coarctation. Aortic stenosis, with the typical listening finding of ejective murmur, cannot escape diagnosis.

In children operated or after percutaneous treatment in childhood, cardiological follow-up will be established by the paediatric cardiologist based on the result of the procedure. Prophylaxis for bacterial endocarditis is necessary in the cases indicated.

Non-critical aortic coarctation can be diagnosed late in children and sometimes even in adults. The measurement of blood pressure in both arms with proper cuff, should be screened during each medical examination at any age. Hypertension is generally a typical signal of aortic coarctation, as well as pain in the legs during exercise.

Tetralogy of Fallot and pulmonary stenosis are the most frequent obstructions of the right heart .

Tetralogy of Fallot is generally operated within the year of age, sometimes with a definitive result, very often with a corrective but not definitive surgery (i.e. correction with transanular patch).
These patients require careful cardiological follow-up and special attention in case of request for sports physical activity.
Pulmonary stenosis has a typical listening finding. When isolated and circumscribed to the valve, the treatment is generally by interventional catheterization.
Open problems in the follow-up of children and adolescent with congenital heart disease in natural history or operated are: prophylaxis for bacterial endocarditis, sports physical activity, moped driving.

CONGENITAL HEART DISEASE: SINGLE VENTRICLE PHYSIOLOGY

Stella Maiolo and Giulio Calcagni
Department of Cardiac Surgery, Cardiology, Heart and Lung Transplantation
Bambino Gesu' Children's Hospital, IRCCS, Rome, Italy

Functional univentricular congenital heart diseases (CHDs) are all complex cyanotic cardiac disorders in which the unique ventricle represents the systolic pump to maintain cardiac output. Different morphological defects may be included in this group, from hypoplastic left heart syndrome to tricuspid atresia to double inlet left ventricle. The incidence of these complex defects ranges from 0.08 to 0.4 per 1,000 births.

Recent advancements in prenatal screening have significantly reduced the incidence of these defects due to the possibility of therapeutic termination secondary to the prenatal diagnosis. Nonetheless, despite the low frequency of this pathology, improvements in treatment have considerably reduced the mortality so that a large number of patients nowadays survive into adulthood.

Surgical treatment of these CHDs may include a first neonatal palliation such as a Blalock Taussig shunt in case of an extreme oxygen desaturation or pulmonary banding when pulmonary overload occurs. A subsequent palliation is represented by a partial cavo-pulmonary connection (also known as bidirectional Glenn procedure). In this procedure, the superior vena cava is disconnected form the atrium and directly connected to the pulmonary artery while the inferior vena cava remains attached to the atrium. The result of this first surgical step is that superior venous drainage can be directly oxygenated in the pulmonary branches and then from pulmonary vein it can be pumped in the systemic circulation. This step usually occurs at about 3 to 6 months of age. The completion of the total cavo-pulmonary connection (also known as Fontan operation) is usually performed between 18 months and 4 years of age. This palliation also consists in connecting the blood deoxygenated from the inferior vena cava to the pulmonary circulation, maintaining the unique single ventricle as the systemic pump to assure the cardiac output.

In the last decades, survival following the Fontan procedure has increased dramatically. However, hospital admission rates for these patients remains significantly higher (> 8 times) compared to the general population, and both length of stay and hospital costs are higher than other CHDs. The improvement in managing these complex univentricular defects, has shifted the interest of clinicians to other equally significant aspects of these patients, particularly concerning the ideal medical management and the possible long term sequelae during Fontan' physiology follow up.

Concerning the possible best clinical treatment of patients with univentricular heart defect, clinicians are still debating. A crucial point in Fontan circulation is represented by a good balance between systemic and pulmonary circulation. Particularly, low pulmonary vascular resistance may improve the Fontan circulation and routinary pulmonary vasodilator therapy has appeared to be safe in the daily practice. Despite that, its benefits still need to be proven. Similarly, concerning the management of coagulation's disorders, a benefit of long-term use of warfarin over aspirin on reducing cerebrovascular injuries has not been demonstrated yet. Patients with single ventricle physiology should also be routinely investigated for different multiple comorbidities which could affect lungs, liver, renal and guts. Moreover, clinicians shall be vigilant for endocrinological complications such as hypothyroidism, visual or hearing impairment, or for different sleep and breathing disorders which may also influence the pulmonary flow and resistance.

Concerning the quality of life and neurodevelopmental follow up, previous paper reported that patients with univentricular or biventricular repair showed similar neurodevelopmental outcomes; however, recent papers demonstrated that a neurocognitive impairment in adolescent and adult with single ventricle physiology may exist.

Furthermore, additional emotional problems have been described in adolescents with univentricular heart defect with mental impairment occurring in female patients more often than in males. The above-mentioned outcomes have been associated with different risk factors such as low body weight (<2.5 kg) at initial operation, low 5-min Apgar score (<4) and need for inter-stage cardiopulmonary resuscitation. Finally, low socioeconomic status has emerged as an important additional risk factor for greater short-term mortality and neurodevelopmental outcomes, especially in children with hypoplastic left heart syndrome and related anomalies.

Finally, as it is widely known for their healthy peers, a positive impact of physical activity on the quality of life may be speculated also in Fontan patients, equally enabling a better cognitive performance and socialization. Regular exercise may play a role on reducing pulmonary vascular impedance by increasing vessel recruitment and vasodilation and this mechanism should be emphasised by clinicians to the Fontan patients and their family, as too often they practice less physical activity in comparison with their peers.

In conclusion, the pathophysiology of the Fontan palliation remains complex but the long-term survival of these patients into adulthood has been growing over the years. As such, it appears mandatory to have a wide and multidisciplinary approach for their follow-up to better manage their peculiar physiology as well as the increasing age that exposes them to greater and always different problems.

EVALUATION AND MANAGEMENT OF THE CHILD AND ADOLESCENT WITH HEART DISEASE

Giovanni Battista Calabri
Pediatric Cardiology Unit
"Anna Meyer" University Hospital, Florence, Italy

Acquired Heart Diseases (AHD) represent a heterogeneous group of conditions that may primarily affect the myocardium, the heart valves, or, less commonly, the coronary arteries. Epidemiology largely depends on the geographical area. Due to the size of the subject, systematic review of every condition is not possible thus I will discuss only the main aspects of few representative diseases.

When we consider low-income countries, the most common acquired HD is Rheumatic Fever (RF). RF is an autoimmune disease associated with group A beta-hemolytic streptococcal infection, in the course of which the patient may develop cardiac involvement. RF mainly involves the mitral apparatus, presenting in the acute phase as mitral valve regurgitation, however if not adequately treated, evolution to mitral valve stenosis is frequent. Antibiotic treatment can reduce the risk of valve involvement and disease progression at two years.

Historically, sub-Saharan Africa has had the greatest prevalence of clinically detected RF, ranging from less than 1 to 14 per 1000 children (Zühlke L, *Heart* 2013). RF is present in Western countries as well, in Italy the estimated prevalence is approximately of 4.1/100 000 (Breda L.- The Journal of Pediatrics, 2012) but evolution to mitral stenosis is extremely rare. In these patients, relapses are virtually absent thanks to the possibility of primary prevention, easy access to antibiotic therapy during the acute phase of *Group A Streptococci* pharyngotonsillitis, and of antibiotic prophylaxis. Since the risk of cardiac involvement considerably increases in case of recurrence of RF, the antistreptococcal antibiotic prophylaxis is mandatory. The drug of choice is i.m. benzatinpenicillin, administered every four weeks at a dose of 600.000 IU in children weighing less than 27 kg and 1.200.000 IU in patients with higher body weight.

An additional complication of RF is carditis. Patients with carditis must be carefully followed up with a close follow-up program. The schedule of reassessments is dictated by the degree of cardiac impairment, the age of the patient, and the evolution during time. In the event of trivial or no valvular regurgitation, a first clinical and echocardiographic evaluation is usually scheduled three months after discharge, then at six months, and a one year reassessment is suggested. When mild to moderate valve regurgitation is present, cardiological evaluations are suggested three months after discharge and then every six-month for one or two years, and afterwards an annual evaluation would be reasonable. In the presence of moderate mitral regurgitation, use of ACE inhibitors should be considered. Whereas, in the presence of moderate to severe mitral valve regurgitation, a comprehensive cardiological evaluation should be considered at 3 and 6 months after hospital discharge and subsequently every six or twelve months, based on clinical judgment. ACE inhibitors and diuretics are particularly supported in the presence of relevant mitral regurgitation and symptoms of heart failure.

In summary, patients with severe carditis and concomitant signs and symptoms of ventricular failure should be closely followed up and they benefit from heart failure therapy.

Kawasaki Disease (KD) is a rare, medium vessel vasculitis with predilection for coronary arteries. Valve involvement in KD is a rare event and affects less than 3-5% of patients in the acute phase of the disease. After appropriate therapy (infusion of immunoglobulin therapy, IVIg), the resolution of fever with reduction of inflammatory markers and the normalization of valvular insufficiency are observed.

Coronary arteries involvement is the most severe cardiac complication of KD. The hallmark of KD is the development of coronary aneurysms, that can be found in 20-25% of patients not adequately and promptly treated with immunosuppressive therapy during the acute phase of the disease.

The development of coronary artery aneurisms represents an irreversible damage to the vascular structure. the presence of aneurisms deeply influences the therapeutic approach, and they have meaningful implications on patient's prognosis and quality of life.

After the introduction of IVIg therapy the incidence of coronary aneurysms has declined from 25% to less than 3%, as well as ongoing mortality of Kawasaki disease that reduced from 3% to less than 0.1%. For this reason, the follow-up of these patients depends on the presence and severity of coronary involvement. For instance, in the absence of cardiac involvement during the acute/subacute phase of the disease, patient can be dismissed from cardiological follow up after four weeks from fever onset. While, in case of coronary dilatation and subsequent reverse remodelling cardiological follow-up should be maintained for at least twelve months after the documented remodeling process of the affected vessel, subsequently no further clinical or instrumental evaluations are strongly indicated. Whereas, in patients with coronary dilatation and aneurysm formation, controls must be rigorous and frequent, especially in cases of giant aneurysms. In patients with small aneurysms, clinical examination and echocardiographic evaluation are recommended at 1 and 6 months from their finding and thereafter yearly assessment in case of clinical stability in addition to an exercise tolerance test every two-three years. In case of medium-sized aneurysms, cardiological evaluation is suggested at three, six, nine, and twelve months in the first year from the onset of the disease, followed by yearly evaluations. Finally, in case of giant aneurysms, follow-up must be very close during the first year from the onset, first monthly and then every 2 months. After the first year, clinical reassessment can be carried out every three-six months. In these subgroup of patients, guidelines recommend to perform a stress test every six-twelve months, although from our experience, cardiopulmonary exercise test adds important clinical information. In the acute phase of KD, myocardial involvement (aseptic myocarditis) is rare. In our centre, aseptic myocarditis occurred in less than 1% of patients with KD. Myocarditis is more frequent as the result of an inflammatory noxa. It can be classified into Primary or Post-Viral Myocarditis, caused by an acute viral infection or post-viral autoimmune response, or Secondary Myocarditis, caused by a specific non-viral pathogen, as bacteria, fungi, autoimmune disease as systemic lupus erythematosus, ionizing radiation and chemical substances (such as chemotherapy drugs). In western countries, viral myocarditis remains a challenging problem in the pediatric age, with two peaks of incidence, one in infancy and another one in adolescence. During the recent COVID pandemic, rare cases of myocarditis have been reported in children both during SARS COV 2 acute infection or three-six weeks after its resolution (Multi-System Inflammatory Syndrome in children, MIS-c). Myocarditis has been also observed in an extremely low minority of male adolescents after COVID – 19 mRNA vaccination, generally characterized by a spontaneous resolution in four-eight weeks. It is worth mentioning, that with a different pathogenic mechanism, patients treated with radiotherapy or chemotherapy, especially for solid tumors, may develop myocardial damage as well, which requires careful evaluation, specific treatment and close monitoring during oncological treatment and after remission.

In conclusion:

- AHD are an heterogeneous group of disease with different prevalence according to the geographic area.
- They may manifest with multiple phenotypes and they can involve different structure of the heart. Variable degree of involvement influence the prognosis and the quality of life of the pediatric population.
- Follow up assessment should be modulated and based on the clinical manifestation and patients symptoms.

Overall, AHD represent a challenge for the cardiologists that should provide patients with a tailored management to ensure the best treatment and quality of life.

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SURGICAL OUTCOME AND MORTALITY IN CHILDREN WITH CONGENITAL HEART DISEASE ACROSS EUROPE

Mads Damkjaer
Department of Paediatrics and Adolescent Medicine
Lillebaelt Hospital
University Hospital of Southern Denmark, Kolding, Denmark

Aim: To evaluate timing of first cardiac surgery, number of cardiac surgeries and postoperative mortality for children with a congenital heart defect (CHD) in their first 10 years of life.

Methods: Population-based data linkage cohort study linking information from to hospital databases. Nine European Regions were included. Data was extracted for children born with CHD, severe CHD (sCHD) and specific cardiac lesions defects such as hypoplastic left heart syndrome (HLHS) and transposition of the great arteries (TGA) and others.

Results: We obtained data on 26,442 children born with a CHD. On average children with CHD are operated at 12.1 (Interquartile range (IQR); 1.6 – 34.0) weeks of age whereas those with sCHD are operated 5 (IQR; 0.7 – 21.8) weeks of age. Timing of first surgery for most subtypes of CHD showed minor differences only across Europe Children with Pulmonary Atresia, HLHS and TGA are those undergoing most cardiac surgeries with an median of 4.1 (IQR; 2.4 – 6.8), 4.0 (IQR; 3.0 - 5.0) and 3.3 (IQR; 2.3 - 4.4) cardiac surgeries in the first 10 years of life. The 30-day postoperative mortality range from 32% for Ebsteins anomaly to 0% for atrial septal defect. Overall survival is >90%, the 5-year survival for HLHS is still only 51.8% (IQR; 45.0 – 59.6).

Conclusion: There were no major differences between the nine regions in timing and number of surgeries for CHD. Despite an overall good prognosis for most CHD's, some lesions are still associated with substantial postoperative mortality and a 5-year survival less than 90%.

THE LIFELONG JOURNEY OF ADULTS WITH CONGENITAL HEART DISEASE

Gabriele Egedy Assenza
Paediatric Cardiology and Adult Congenital Heart Disease Program
Department of Cardio-Thoracic and Vascular Medicine
IRCCS Azienda Ospedaliero-Universitaria of Bologna, Italy

The unprecedent improvement in the early-term results of congenital heart disease (CHD) therapeutics has led to the unmatched survival of neonates and children with even the more severe clinical spectrum of CHD. This phenomenon occurred over a relatively short period of time and was able to induce a profound shifting in CHD epidemiology. Nowadays adults with CHD (ACHD) have outnumbered children with CHD, and although this was a relatively known aspect in simple CHD epidemiology, current population-based data do confirm that this epidemiology shifting has occurred also for the most complex form of CHD including lesions carrying a systemic right ventricle and patients with single-ventricular anatomical cluster, often palliated with Fontan circulation.
It has been shown that the ACHD population is prone to a number of long-term detrimental and maladaptative cardiovascular adversities including (but not limiting) to heart failure, arrhythmias, thrombo-embolic events, need for de-novo or redo surgeries or trans-catheter therapeutics including radio-frequency ablation of complex arrhythmic substrate, cardiovascular mortality including sudden cardiac death and others.
Life with CHD is also often plagued by psychological difficulties, inappropriate exclusion from sport activities, poor work opportunities, excessive risk or unsupported exclusion related to pregnancy and reproduction, drug or alcohol abuse, dysfunctional process leading to autonomy and self-determination.
A specific area of concern is focusing on the gaps in cardiovascular care that does often occur during the transition phase from adolescence to adult age. Patients who are not longitudinally followed-up during this delicate phase are reported to present higher rate of emergency hospital admissions and adverse outcomes.

ACHD cardiovascular medicine rapidly matured in the last 30 years with significant effort to improve field recognition, standardized training and standardized care. It has been reported that ACHD patients who are routinely followed in tertiary referral care centers with appropriate expertise and clinical protocols do present improved outcomes compared to ACHD followed with less standardized approach.

Accordingly, care for patients born with CHD does not end with primary repair of their congenital lesion but it must include longitudinal and expert follow-up throughout life. CHD are a group of chronic cardiac lesions, but living with a chronic condition is a lifelong journey that requires lifelong care.

LIVING WITH A CONGENITAL HEART DISEASE: PSYCHOLOGICAL ASPECTS IN ADULTHOOD

Enrica Longo
Psychologist of Little Big Hearts Association
Unit of Pediatric Cardiology and Cardiosurgery
S.Orsola-Malpighi, Bologna, Italy

Adults with congenital heart disease are considered a growing patient population. In addition to medical problems, these patients perceive specific psychosocial concerns and challenges that influence their quality of life, emotional functioning, self-perception, and peer relationships.

Oris et al. introduced the concept of illness identity, which underlines the importance of integrating the illness into one's sense of self in order to enhance psychological adjustment and physiological health outcomes in adults with congenital heart disease.

Patients need to face different challenges during their lifetime. The patients' environment (parents, friends), their experiences with health care, and their personal attributes all contribute to the integration of illness in their lives.

Health care providers can promote the illness integration process by not colluding with the patient's implicit requests; helping the parents of children with heart defects to understand the importance of clearly telling them about their condition; accomodating the patient's and the family's needs; helping the patients to get a more accurate perception of their condition; discovering adaptive coping strategies with them to deal with their condition more effectively.

LITTLE BIG HEARTS: A FANTASTIC REALITY INSIDE THE HOSPITAL

Patrizia Romualdi
Vice President - Little Big Hearts, Bologna, Italy

The role of the Little Big Hearts Association inside the hospital is multiple, from 1997: We welcome. We listen. We support.

Our association has been dealing with Hearts for 25 years. We are parents and volunteers united by the same common goal: help congenital heart patients and their families who are walking a path, a course of treatment at the Operating Units of Pediatric and Developmental Age Cardiology and Heart Surgery of the Sant'Orsola IRCCS Polyclinic in Bologna. We take care of the person and of his heart, but not from a medical point of view. We live the ward, we feel as parents and sons, we try to help all of them, understanding the feelings and the humanities. All of us lived the terrible experience that now they are living, therefore we can understand their feelings.
Many of these patients come from outside the Region: all over Italy, some patients are from Europe, as Greece and also from Eastern and African countries. We reach out to all these patients and our first job is to provide a 'choir' of people: a network that supports and protects together. Our job is a great team effort.

First aim is to help them inside the ward, second is assist them with psychological support, therefore we take care economically of this work, as well as we take care of the work of social assistance to patients and family members in the pre and post-phases of their path.
Psychologists and social workers welcome the patient and the family, support them in the waiting times before hospitalization and during the treatment, including the transplant. Protection of the rights of the patient and family members, from the treatment path to the return home. In particular for those arriving from outside the region: information related to the regional legislation of origin, reimbursement requests for admissions. Then, our aim was to give an home to our patients family: Open the door and feel at home "7 apartments that welcome: the patient and family members, from the beginning of treatment path to the return home. When the treatment is transplant, even more important is to stress all these components. Because in heart transplant there is a very important emotional part to consider. Again is a great team effort.
They coordinate with the medical staff that follows and performs the transplant: cardiologist, cardiac surgeon, anesthetist, transplant nurses. The Focus on transplant: psychodiagnostic assessment for inclusion in the list for transplant; assistance and psychological support to patients and family members in the pre- and post-cardiac transplant phases. Transplantation is not just a death. It is a death with life in it.
Everyone contributes with their skills so that every laboratory, every event, every relationship with the patient or caregiver, brings a smile. The support is emotional but also practical, because these people need to know and be helped even in simple small actions.

Finally, we wished to color their life for a better wellbeing, by a storytelling on our experiences and everyone can feel it just looking at the paintings in the ward walls!

MY (EXTRA)ORDINARY LIFE: FROM SURGICAL OPERATIONS TO THE TRANSPLANT

Emanuele Galli
GUCH ((Grown Up Congenital Heart) waiting for transplant
Investigative Agency Discovery, Bologna, Italy

My name is Emanuele Galli, I am 35 years old, I was born with a congenital heart disease and during my entire life I've had 6 surgeries. Last December I suffered from ischemic stroke and fortunately I had neither brain damages nor complications. I suffer from celiac disease and I've had a staphylococcus aureus infection that has affected my left keen eating my cartilage. Now, I am waiting for a heart transplant.

My life is quite normal, made up of daily adventures, of overcoming limits and mainly of never giving up.
I've travelled all over the world, I've been on more than 2000 meters heights without oxygen and I've also tried dozens of roller-coasters.
I regularly work and I've built my network of contacts made up of a few, but good people: I have a girlfriend who supports and encourages me daily, a few but loyal friends and above all a wonderful family.

I am currently waiting to have one of the most complicated surgery of modern medicine and I don't know whether my body will accept the "special guest" and if I will learn to live with the heart of another person in my chest.

Meanwhile, I face everything with my head held high with all the positivity and strength that have distinguished me over the years

Session IV – Oral Presentations, Virtual (pre-recorded presentations)

Meeting Room "Ginestra"

Survival of Infants and Children Born with Severe Microcephaly, Texas, 1999-2015
Lisa K. Marengo

Developing a prediction model for risk of preterm birth among infants with orofacial cleft defects in Texas
A.J. Agopian

Early pregnancy outcomes and congenital anomalies following COVID-19 vaccination: a whole population, matched cohort study using Scottish national health records
Clara Calvert, Rachael Wood

Accuracy of congenital anomaly coding on live birth children recorded in health care databases
Hermien E.K. de Walle

Congenital cardiac anomalies among babies (live born /stillborn) at birth in a Tertiary care hospital of Northern India over a period of seven years
Neelam Aggarwal

Survival of Infants and Children Born with Severe Microcephaly, Texas, 1999-2015

LK Marengo[1], N Archer[2], C Shumate[1], M Canfield[1], M Drummod-Borg[1]
[1]*Birth Defects Epidemiology and Surveillance Branch, Texas Department of State Health Services, Austin, TX;* [2]*Environmental Epidemiology & Disease Registries Section, Texas Department of State Health Services, Austin, TX*

Email of corresponding author: lisa.marengo@dshs.texas.gov
Birth Defects Program on which the work is based: Birth Defects Epidemiology and Surveillance Branch, Texas Department of State Health Services, Austin, TX

Background and Objectives: Severe microcephaly is a brain reduction defect where the delivery head circumference is <3rd percentile for gestational age and sex. Lifelong morbidities may include intellectual disability, seizures, cerebral palsy, and ophthalmologic disorders. Our objective was to evaluate survival among Texas infants with severe microcephaly delivered during 1999-2015.

Methods: Infants with severe microcephaly were identified in the Texas Birth Defects Registry. Survival estimates and hazard ratios (HR) were calculated using the Kaplan-Meier method and Cox proportional hazards models stratified by presence vs. absence of co-occurring defects.

Results: We identified 496 deaths by age 4 years; most deaths (42.9%) occurred in the neonatal period, another 39.9% died by 1 year of age,, . Overall infant survival was 84.8% (83.4-86.1). Subgroups with the lowest infant survival included those who had chromosomal/syndromic conditions (66.1%), very preterm deliveries (63.9%), or co-occurring critical congenital heart defects (44.0%). Among infants with a chromosomal/syndromic co-occurring defect, the risk of death was nearly 3-fold higher among those with proportionate microcephaly (i.e., small baby), relative to non-proportionate; HR=2.84 (2.17-3.71). Trisomies were the leading underlying cause of death (24.8%).

Discussion and Conclusions: Overall, infants with severe microcephaly had a high 4-year survival rate which was reduced in the presence of co-occurring defects.

Developing a prediction model for risk of preterm birth among infants with orofacial cleft defects in Texas

KL Ludorf[1], RH Benjamin[1], MA Canfield[2], AJ Agopian[1]
[1] Department of Epidemiology, Human Genetics and Environmental Sciences, UTHealth School of Public Health, Houston, Texas; [2] Birth Defects Epidemiology and Surveillance Branch, Texas Department of State Health Services, Austin, Texas

Email of corresponding author: a.j.agopian@uth.tmc.edu
Birth Defects Program on which the work is based: Not applicable

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Background and Objectives: Preterm birth (<37 weeks gestational age) occurs in ~15% of infants with orofacial clefts, which is more frequent than it occurs in the general population. Risk prediction models for preterm birth developed among the general population have demonstrated clinical utility for screening and risk stratification. We aimed to develop a preterm birth risk prediction model specific to infants with orofacial clefts.

Methods: Gestational age at birth and maternal and infant potential predictors were ascertained from vital and medical record data provided by the Texas Birth Defects Registry (TBDR) for 1999-2014 deliveries with orofacial clefts. Using unconditional logistic regression, we developed a multivariate risk prediction model among a training group of randomly selected cases (75%). The model was applied to a validation group consisting of the remaining cases (25%). Area under the curve (AUC) and goodness-of-fit statistics were calculated to assess predictive performance and model fit. Several secondary analyses were conducted among subgroups of interest (e.g., by cleft phenotype, cases with isolated versus multiple defects, and for <32 weeks versus term delivery).

Results: Among 6,774 liveborn nonsyndromic cases included in analyses, 1,794 infants had cleft palate alone and 4,980 infants had cleft lip with or without cleft palate. The predictors of preterm birth among these cases that were included in the final model were: maternal hypertensive status, diabetic status, prenatal care received, the presence of additional congenital anomalies, and short inter pregnancy interval. The model performed modestly overall and in most of the secondary analyses, with an overall AUC=0.66 in the training group and AUC=0.64 in the validation group, both with excellent calibration. However, the performance was slightly better for predicting <32 weeks versus term delivery (AUC=0.72).

Discussion and Conclusions: To our knowledge, we developed the first multivariate prediction model for preterm birth among infants with orofacial clefts. Our results are particularly encouraging for working toward risk prediction for preterm delivery before 32 weeks. New avenues for screening and early intervention for extremely preterm birth may ultimately result in reduced morbidity and mortality among infants with orofacial clefts.

Early pregnancy outcomes and congenital anomalies following COVID-19 vaccination: a whole population, matched cohort study using Scottish national health records

C Calvert[1,2], J Carruthers[3], C Denny[3], J Donaghy[3]3, S Hillman 1, LEM Hopcroft [3], [4], L Hopkins[3], A Goulding[3], L Lindsay[3], T McLaughlin[3], E Moore[3], J Pan[5], B Taylor[3], C Robertson[3,5], A Sheikh[1], S Stock[1,3], R Wood[1,3]
[1]Usher Institute, University of Edinburgh, Edinburgh, UK; [2] Faculty of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine, London UK; [3] Public Health Scotland, Scotland, UK; [4]Bennett Institute for Applied Data Science, Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, UK; [5]Department of Mathematics and Statistics, University of Strathclyde, Glasgow, UK

Email of corresponding author: clara.calvert@ed.ac.uk
Birth Defects Program on which the work is based: Not applicable

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Background and Objectives: To date there is no randomised controlled trial evidence on the safety or effectiveness of COVID-19 vaccination in pregnancy. Evidence from observational studies suggests COVID-19 vaccines are effective in reducing the severity of SARS-CoV-2 infection in pregnancy; however, evidence on any association between COVID-19 vaccination and miscarriage or congenital anomalies is sparse, and is absent for ectopic pregnancy. A recent systematic review by Prasad et al., for example, identified only two studies exploring the association between vaccination and miscarriage and, to our knowledge, there have only been two studies published on congenital anomalies. Given sub-optimal vaccination uptake in pregnancy, there is an urgent need for evidence on the safety of COVID-19 vaccines in pregnancy. We assessed whether there is any evidence for an association between COVID-19 vaccination and miscarriage, ectopic pregnancy, congenital anomalies or microcephaly.
Methods: Routine health records for all residents of Scotland were used to conduct a matched cohort study. We identified women vaccinated between six weeks pre-conception up to the end of an outcome-specific exposure period. The end of the outcome-specific exposure period is 19 weeks, six days of pregnancy (19+6 gestation) for miscarriage, 2+6 for ectopic pregnancy, 19+6 for congenital anomalies and to the end of pregnancy for microcephaly. Primary analyses used historical (pre-pandemic era) controls, with three unvaccinated women matched to each vaccinated woman on maternal age, gestational age at vaccination and season of conception. Supplementary analyses used contemporary controls. Multinomial logistic regression was used to estimate the association between vaccination and outcomes (captured up to 27 days after birth, depending on outcome), adjusting for matching factors and confounders including deprivation and clinical vulnerability.
Results: There were 18,780 pregnancies where the woman received vaccination between six weeks conception and up to 19+6 gestation; BNT162b2 (Pfizer-BioNTech) was the most commonly administered vaccination (72.9%) and 26.6% of women receive two doses in this exposure period. 9.1% of these pregnancies ended in miscarriage. Primary analyses found no association between vaccination and miscarriage (adjusted Odds Ratio [aOR]=1.02, 95% Confidence Interval [CI]=0.96-1.09), with comparable results from the supplemental analysis. Of 10,570 pregnancies where the woman received vaccination up to 2+6 gestation, 1.2% ended in ectopic pregnancy. There was no evidence for an association between vaccination and ectopic pregnancy (aOR=1.13, 95% CI=0.92-1.38), but there was imprecision around estimates due to low numbers. Results of the supplementary analysis were similar to primary analysis. Analyses are ongoing for congenital anomalies and microcephaly, with results available from the end of July. "
Discussion and Conclusions: We found no evidence that COVID-19 vaccination is associated with miscarriage, which is line with what was found in two previously published studies (from Norway and the USA). This is the first study to look at the association between vaccination and ectopic pregnancy, and while we find no evidence of an association, we had limited power for this outcome. This study adds to the growing body of evidence on the COVID-19 safety of vaccination in pregnancy but highlights the need for further analyses across different settings, particularly for rarer outcomes such as ectopic pregnancy**.**

Accuracy of congenital anomaly coding on live birth children recorded in health care databases

HEK de Walle[1], M Loane[2], E Garne[3], J Given[2], E Limb[4], Joachim Tan[4], SK Urhoj [3, 5], AJ Neville[6], E Ballardini[7], A Pierini[8], M Santoro[8], R Lutke[1], S Jordan[9], I Scanlon[9], C Cavero-Carbonell[10], L García[10], A Heino[11], M Gissler[11], D Wellesley[13], A Latos-Bieleńska[14], A Jamry-Dziurla[14]4, MK Bakker[1] JK Morris[4]

[1] University of Groningen, University Medical Center Groningen, Department of Genetics, The Netherlands; [2] Institute for Nursing and Health Research, Ulster University, Northern Ireland, United Kingdom; [3] Department of Paediatrics and Adolescent Medicine, Lillebaelt Hospital, University Hospital of Southern Denmark, Kolding, Denmark; [4] Population Health Research Institute, St George's, University of London, United Kingdom; [5] Section of Epidemiology, Department of Public Health, University of Copenhagen, Copenhagen, Denmark; [6] IMER Registry, Centre for Epidemiology and Clinical research, University of Ferrara and Azienda Ospedaliero Universitario di Ferrara, Italy; [7] Neonatal Intensive Care Unit, Paediatric Section, IMER Registry (Emilia Romagna Registry of Birth Defects), Dep. of Medical Sciences, University of Ferrara, Italy; [8] Unit of Epidemiology of Rare diseases and Congenital anomalies, Institute of Clinical Physiology, National Research Council, Pisa, Italy; [9] Faculty of Medicine, Health and Life Science, Swansea University; [10] Rare Diseases Research Unit, Foundation for the Promotion of Health and Biomedical Research in the Valencian Region, Valencia, Spain; [11] Finnish Institute for Helath and Welfare (THL), Helsinki Finland; [13] University of Southampton and Wessex Clinical Genetics Service, Princess Anne Hospital, Southampton SO16 5YA, United Kingdom; [14] Polish Registry of Congenital Malformations, Chair and Department of Medical Genetics, University of Medical Sciences, Poznan, Poland

Email of corresponding author: h.e.k.de.walle@umcg.nl
Birth Defects Program on which the work is based: EUROlinkCAT WP6 Working Group

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Background and Objectives: Electronic health care databases (EHCDs) are increasingly being used to investigate the epidemiology of congenital anomalies (CAs), often due to the absence of a CA register. However, because EHCDs are not designed for research or surveillance, their data on CAs may be inaccurate and incomplete. Objectives: To evaluate the accuracy and the quality of the coding of CAs in hospital databases, compared to EUROlinkCAT data which was assumed to be the gold standard, and to ascertain which CAs can be accurately identified using hospital databases.

Methods: Eleven EUROCAT registries linked their CA data to regional or national hospital databases. Inclusion criteria for this study were all live births born between 2010-2014, recorded in the EUROCAT registries and linked to hospital data and all children identified in the hospital databases with a CA code registered in the first year of life. We focused on 17 specific anomaly groups. For each child we compared the diagnosis codes in the hospital database to the codes in EUROlinkCAT and calculated sensitivity for the specific anomaly groups. Positive predictive value was calculated using data from six registries with access to hospital data of the full reference population. For a specified CA, the exact PPV is the proportion of children in hospital data correctly identified in EUROlinkCAT with exactly the same CA code as they have in the hospital data.

Results: Most registries linked more than 85% of their cases to hospital data. The proportion of linked EUROlinkCAT cases with a CA code recorded in the hospital data in the first year of life varied from 49% in Zagreb to 96% in Valencian Region. In most registries sensitivity was high (>80%) for cleft lip with or without cleft palate, Down syndrome and Hirschsprung's disease. Low sensitivity (<50%) was frequently observed for clubfoot and congenital hydronephrosis. PPV was high (>80%) for gastroschisis and Down syndrome and low (<50%) for ASD.

Discussion and Conclusions: The comparisons between CA coding in hospital databases and the coding in EUROlinkCAT highlighted differences between the hospital databases, often due to differences in the healthcare systems. Information is lacking in hospital databases on terminations of pregnancy, children with CAs that do not require hospitalisations and children with CAs that are treated in specialist centers outside the region of coverage. In the absence of a CA register, hospital data may be used to monitor certain CAs with a high sensitivity and low TOPFA rate, but additional data sources should be used to capture information on CAs with a low sensitivity.

Congenital cardiac anomalies among babies (live born /stillborn) at birth in a Tertiary care hospital of Northern India over a period of seven years

N Aggarwal [1], A Angral [1], S Venkataseshan [2], B Sharma[1], V Suri[1], N Kakkar [3]
[1] Department of Obstetrics & Gynaecology; [2] Department of Pediatrics (Neonatology); [3] Department of Histopathology, PGIMER Chandigarh. India

Email of corresponding author: drneelamaggarwal@gmail.com
Birth Defects Program on which the work is based: Newborn Birth defects surveillance

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Background and Objectives: Globally an estimated 8 million newborns are born with congenital anomalies annually, of which almost 3 million children under five years of age die due to associated morbidity. In India birth defects prevalence among newborn and under five children ranges from 61 to 69.9/1000 live births. Congenital heart disease (CHD) is the leading cause of infant death due to congenital anomalies.
Objective: To describe the types of congenital cardiac defect among newborns and stillborns delivered in a tertiary care hospital of northern India over a period of seven years (July 2014 to June 2022).

Methods: The data used in this study is part of ongoing project of hospital-based birth defect surveillance in collaboration with CDC WHO SEAR. All the live born and stillborn foetuses with recognizable BD or those who were found to have BD in the antenatal period by an ultrasonography and/or foetal echocardiography were included. Each birth defect was categorized as per International Classification of Diseases (ICD) 10 coding and the prevalence of BD was calculated

Results: During the study period, a total of 43,228 women delivered, out of whom 2,539 delivered stillborns (SBR 58.7 per 1000 total births). The prevalence of birth defects among live born was 80 per 1000 live births whereas it was 135 per 1000 among stillborns. Overall, 32.7% of birth defects were of cardiovascular system, second highest were central nervous system defects. Ventricular septal defect was the commonest accounting for 23.2 % of cardiac anomalies and most of these cases were diagnosed in the antenatal period.

Discussion and Conclusions: The prevalence of congenital anomalies is very high in this study as it analyses facility based data of a referral institute. A significant number of women were diagnosed as having a foetus with cardiovascular malformations in the antenatal period and referred. However, women who were carrying lethal cardiac defects like hypoplastic heart were diagnosed very late. So it is crucial to have universal second trimester obstetric ultrasound including basic cardiac screening for optimal outcome.

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