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CLINICAL PRACTICE GUIDLINES FOR THE DETECTION, DIAGNOSIS OF FETUS AND NEONATAL CONGENITAL ANOMALY

Purpose and Goal Description

To outline the protocol for detection, diagnosis, treatment of fetus or newborn with congenital anomaly who meet pathway criteria.
To monitor infants for potential mortality or morbidity effects related to congenital anomaly.

Abbreviations

Amniocentesis	Antenatal procedure involving the removal of a sample of amniotic fluid for the purposes of chromosomal or genetic testing
CA	Congenital Anomaly
CCHD	Critical Congenital Heart Disease
CPAP	Continuous Positive Airway Pressure
CPG	Clinical Practice Guideline
EBM	Evidence-Based Medicine
FNB	Fetal Nasal Bone
FNT	Fetal Nasal Translucency
NICU	Neonatal Intensive Care Unit
NTD	Neural Tube Defect

Source CPG Developer

Introduction

Congenital anomalies (also called birth defects) include a wide range of structural and functional abnormalities that are present at birth, or that occur later but originate in the prenatal period. Diagnosis may occur before birth, at birth, or months or years after birth. Major anomalies can result in death and/or disability and require substantial medical care throughout life, causing significant economic and social burden (for example, spinal cord and heart anomalies). In Saudi, major congenital anomalies occur in about 4.1% of newborns and 8% to 10% of stillbirths.[1]

Many countries offer to all pregnant women at least one routine mid-trimester fetal ultrasound scan (anomaly scan), with the goal of detecting congenital anomalies[2-3]. Additionally, pregnant women at high risk for congenital anomalies are normally offered a detailed fetal anatomical examination[1], usually called 'referral scan'. In some countries, there are networks that allow sonographers and physicians who perform screening scans to refer pregnancies with suspected or detected fetal anomalies to specialized centers which not available in our settings. A referral scan consists of a detailed ultrasound examination that requires specific expertise and its aim is to confirm and define the anomaly[3,4]. At the referral center, cases with confirmed fetal anomalies are managed by a multidisciplinary team[2] and may undergo other imaging investigations, such as magnetic resonance imaging[5], fetal invasive procedures[6] and individualized counseling[7].

Fetal risk factors for structural anomalies have been well-described, including suspected fetal anomaly at the anomaly scan[7], increased nuchal translucency (NT) thickness in the first trimester[2], early-onset fetal growth restriction (FGR)[9] and known fetal genetic anomaly[9].

In Saudi Arabia, prevalence of major congenital anomalies in Saudi Arabia is a largely understudied area. Knowing the prevalence of birth defects and their trends is important in identifying potential factors that are either causative or preventative. Kurdi et al estimated that the birth prevalence of CA is 4.12% in Saudi Arabia. The common types of CA are congenital heart disease (148 per 10 000), renal malformations (113), neural tube defects (19) and chromosomal anomalies (27)[1].

In Saudi Arabia, birth defects remain the leading cause of death among children, with high rates of consanguineous marriage and genetic diseases[19-10].

The aim of this clinical protocol guideline (CPG) is to provide evidence-based recommendations for management of fetus or neonates with CA including detection, diagnosis Early antenatal of major congenital anomalies for possible termination of pregnancy, fetal or neonatal care.

Knowing the prevalence of birth defects and their trend is important in identifying potential novel factors that are either causative or preventative.

Scope and Purpose

Disease/Condition:

Congenital anomalies or birth defects are defined as structural abnormalities diagnosed antenatally, at the time of birth or in the first few years of life[11].

Guideline Objective(s)

This CPG aims to provide evidence-based recommendations for the early detection, diagnosis and treatment of neonates with CA in order to decrease the perinatal mortality, if not long-term disability in the diagnosed infant and are a burden to families, society and the healthcare system.

Health / Clinical Question (PIPOH)

P: Patient (Target Population):

Fetus or Newborn infants at risk of or diagnosed with CA

I: Interventions and Practices Considered / CPG Category:

Early detection and diagnosis and treatment

P: Professionals (Intended / Target Users or Stakeholders):

Healthcare professionals in primary, secondary, and tertiary care of neonatal and maternity services including physicians, nurses, pharmacists, laboratory technicians

Clinical Specialties

Physicians (pediatricians, neonatologists, geneticist, obstetricians, and radiologists), clinical pharmacists, nurses, radiology & laboratory technicians, and midwives**.** These identified target users will use this CPG to inform their clinical decision- making and standards of care.

O: Major Outcomes Considered:

1. Decrease death (Mortality)

2. Decrease major neurodevelopmental disability in surviving babies (Morbidity)
3. Prevention of common CA.

H: Healthcare Settings:

Primary, secondary, and tertiary neonatal healthcare services are mainly nurseries, NICUs, and outpatient clinics in Saudi Arabia.

Recommendations

Definitions of Quality of Evidence (QoE) and Strength of Recommendations (SoR)

▪ Preconception:

Key Recommendations

Detection:

Some **congenital anomaly** are common in some families and to be detectable during planned pregnancy and others are not. Screening is offered by MOH maternity services to maximise antenatal detection of specified conditions where pregnant people choose, and present in time.

Investigations	History, clinical exam and Tests
Routine visit preconception	• History of the following: • If previous documented birth defect or genetic disease by genetic test (from the list) in the family either partner • If High Risks Cases: • Chronic disease e.g. epilepsy, diabetes, lupus • Recurrent unexplained abortion more than two • History of IUFD not related to OBGYN causes
Specific investigations (if needed)	• Referral to specialized center center (MFM) in the cluster • If MFM not available , referral made to Virtual Genetic or combined Services by calling # 0502440062 • Email: svh_operation@moh.gov.sa • Blood to be done accordingly • Report should go back to committee (Excel sheet)

▪ During pregnancy:

Investigations	History, clinical exam and Tests
Routine visits during pregnancy	• History of previous documented genetic disease in the family or previous preconception • History of suspecious or confirmed congenital anomaly in this pregnancy
Specific investigations (if needed)	• **1st Trimester:** • NIPT at gestational age 9-10 weeks • Fetus US at 11-13 (FNB and FNT) • Cordocentesis Or Amniocentesis at gestational age 13-15weeks • **2nd Trimester:** • AFP screening 16-18 weeks • Anatomical FUS 18-20 weeks ➢ If results Negative and normal to be back to primary physician ➢ If result suspect or confirmed disease from the list to be refer to genetic center according to pathway and document result to committee (Excel sheet)

▪ Neonatal period:

Investigations	History, clinical exam and Tests
Routine examination post delivery by pediatrician or neonatologist	• History of previous suspected or documented anomaly disease in the pregnancy • If alive follow pathway • If IUFD or died post-delivery Skeletal survey (to be saved in the PACS and blood in the filter paper (NBS) should be done (under mother medical record number)
Specific investigations (if needed)	• Neonatal workup (if it's not available in the same center referral should made to Virtual Genetic or combined Services by calling # 0502440062 • Email: svh_operation@moh.gov.sa • If results Negative and normal case to be closed • If confirm CA diagnosis, to be register in Report should go back to committee (Excel sheet)

▪ Pediatric period:

Investigations	History, clinical exam and Tests
child workup according to geneticist	• History of previous documented congenital anomaly disease in antenatal or neonatal period • Blood test (to be determined) by MRP or Geneticist • Confirm diagnosis pathway in Genetic Registry • Counselling for future pregnancy
Specific investigations (if needed)	• Requiring Test to be decided by MRP or Geneticist

Management:

Clinical Management of infants who suffer from CA is essentially supportive. Or according to the disease.

Implementation Strategies and Tools

Several implementation frameworks and manuals have recommended the following strategies or interventions:

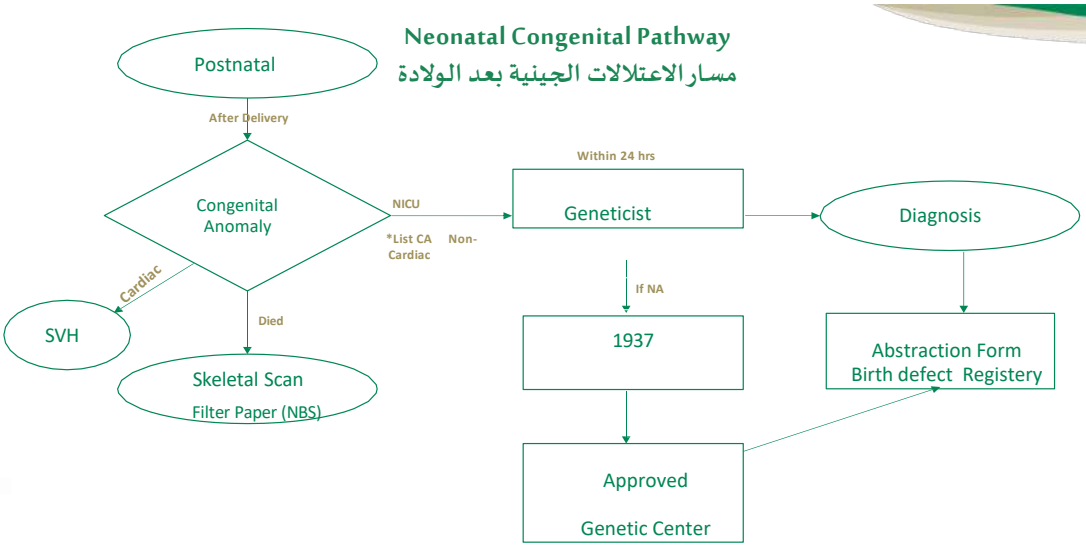
1. Leadership commitment, engagement, and support.
2. Local clinical and quality champions.
3. Dissemination (printed and electronic).
4. Regular training and education.
5. Regular audit and feedback (along with regular review and update promotes the concept of the 'living CPGs'.
6. Networking with relevant existing projects
7. Parents

Implementation Tools

The CPG adaptation group decided to adopt all of the CPG implementation tools proposed by the QMN CPG.

1. **Checklist for CA**

2. Flowchart/ Algorithm: Management



3. Flowchart: CA investigations and definition

Term	Definition
Antenatal	The period from conception to birth.
Antenatal diagnosis	A diagnosis in a pregnancy at any gestation prior to delivery.
Birth prevalence of congenital anomalies	The total number of babies diagnosed with a congenital anomaly (live births, stillbirths, late miscarriages, and terminations of pregnancy for fetal anomaly) compared to the total number of births (live births and stillbirths).
Births/total births	Live births and stillbirths as recorded by the MOH
Infant mortality	The number of infant deaths per 1000 live births.
Late miscarriage	Late fetal deaths from 20 to 23 completed weeks of gestation.
Live birth	A baby showing signs of life at birth as recorded by the MOH
Live birth prevalence	The total number of babies diagnosed with a congenital anomaly that are live born compared to the total number of live births.
Total births	Total number of live births and stillbirths.
Perinatal deaths	Feta deaths >28weeks GA and deaths under 7 days of age as recorded by the MOH.
Perinatal mortality	The number of perinatal deaths per 1000 total births.
Neonatal mortality	The number of neonatal deaths per 1000 live total births.
Post-neonatal period	From 28 days of life to 1 year of age.

Term	Definition
Congenital anomaly	Condition present at delivery, probably originating before birth, and includes structural, chromosomal, genetic, and biochemical anomalies.
Genetic anomalies	Includes genetic syndromes, hereditary skin disorders, skeletal dysplasias and chromosomal anomalies
Non-genetic anomalies	Includes anomalies with no known genetic cause. Not all babies undergo genetic testing, so it is likely that some of these anomalies are of genetic origin.
Amniocentesis	Antenatal procedure involving the removal of a sample of amniotic fluid for the purposes of chromosomal or genetic testing.
Chorionic villus sampling (CVS)	Antenatal procedure involving the removal of a sample of placental tissue for the purposes of chromosomal or genetic testing.
Fetal Nasal Bone	Fetal nasal bone determination. The nasal bone may not be visualized in some babies with certain chromosome abnormalities, such as Trisomy 21
Fetal Nuchal Translucency	Nuchal translucency screening uses an ultrasound to examine the area at the back of the fetal neck for increased fluid or thickening.
Full karyotype	Visual inspection of all chromosomes down the microscope, enabling assessment of chromosome number and integrity.
Stillbirths	A baby born after 24 or more completed weeks of gestation and which did not, at any time, breathe or show signs of life as recorded by the MOH
Teratogen	Substance or other factor that can cause congenital anomaly by affecting fetal development.

Term	Definition
Invasive testing	Antenatal tests including amniocentesis and chorionic villus sampling used to diagnose chromosomal and genetic anomalies. In these tests, a needle is inserted directly into the uterus to take a sample.
Non-invasive prenatal testing (NIPT)	Screening test for specific chromosomal disorders by testing fragments of fetal DNA found in the maternal blood stream.
Rapid aneuploidy testing	A genetic test with a short turnaround time; it counts the copy number of specific regions on chromosomes 13, 18, 21, X and Y.
FNSP conditions Cheklists:	The auditable conditions screened under the Fetal or neonatal Anomaly Screening Programme (FASP). All NTD All CCHD Cleft lip +/- palate Bilateral renal agenesis Lethal skeletal dysplasia Congenital diaphragmatic hernia Omphalocele Gastroschisis Trisomy 21 Trisomy 18 Trisomy 13

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APPENDIX

- ❑ **Clinical Pathway for Intrauterine Fetal Demise (IUFD) with a Focus on Genetic Disorders**
- ❑ **Data Abstraction Form (Attached)**
- ❑ **ICD 10 DIAGNOSIS Attached**

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Data Abstraction Form

سجل المتابعة للامراض الوراثية والجينية

م	التاريخ	الاسم	الميلاد	رقم الملف	رقم الهوية	المنشئة المحال منه	المنطقة	تشخيص الاعتلال الجينية والوراثي	الفحص الذي تم عمله	نتيجة الفحص	هل الزواج زواج قرابة (الإجابة: نعم/لا)	هل تاريخ مرضي لاسوى خلال الحمل (الإجابة: نعم/لا)	هل يوجد تاريخ عائلي أو عوامل خطورة	في حال نعم ذكره	العمر الحملي عند الولادة	الوزن عند الولادة	في حال الوفاة، اذكر تاريخ الوفاة	الطبيب المعالج	رقم التواصل للاهالي
Sr	Date	Name	Date of Birth	MRN	Id No.	Name of health institutin	Region	Congenital and Chromosmal dagonosis based on ICD 10	Test has done	Test Result	Consanguinity Marriage (Yes/No)	maternal infections History (Yes/No)	Family History or Risk factors (Yes/No)	If Yes, Mention	Gestional Age at Birth	Baby Wt at Birth	If Baby died, Mention date of death	Treating Physician	Family Contact Number

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ICD 10 DIAGNOSIS

	Birth defects	ICD-10 CODE
1.	Nervous system	Q00-07
2.	Anencephaly	Q00.0
3.	Encephalocele	Q01.0
4.	Microcephaly	Q02
5.	Congenital Hydrocephalus	Q03.0
6.	Holoprosencephaly	Q04.0
7.	spina bifida	Q05.0
8.	Eye, ear, face and neck	Q10-18 (can ask the doctor)
9.	Anophthalmos	Q11.0
10.	Microphthalmos	Q11.2
11.	congenital cataract	Q12.0
12.	Aniridia	Q13.1
13.	Congenital glaucoma	Q15.0
14.	Anotia	Q16.0
15.	Microtia	Q17.2
16.	circulatory system	Q20-28 (can ask the doctor)
17.	Transposition of great arteries	Q20.3
18.	Single ventricle	Q20.4
19.	Ventricular Septal defect	Q21.0
20.	Tetralogy of fallot	Q21.3
21.	pulmonary valve atresia/ stenosis	Q22.0
22.	Patent ductus arteriosus	Q25.0
23.	Coarctation of aorta	Q25.1
24.	Respiratory system	Q30-34 (will ask the doctor)
25.	Choanal atresia	Q30.0
26.	Cleft palate	Q35
27.	Cleft lip	Q36
28.	Cleft lip with palate	Q37
29.	Cleft hard palate with unilateral cleft lip	Q37.1
30.	Cleft soft palate with bilateral cleft lip	Q37.2
31.	Digestive system	Q38 (can ask the doctor)

32.	Esophageal atresia/ stenosis	Q39.0
33.	Congenital Hypertrophic pyloric stenosis	Q40.0
34.	Duodenal atresia/ stenosis	Q41.0
35.	Small intestine atresia/ stenosis	Q41.0
36.	Anorectal atresia/ stenosis	Q42.0
37.	Congenital megacolon	Q43.1
38.	Atresia of bile duct	Q44.2
39.	Genital organs	Q50-56
40.	Undescended testicle	Q53.0
41.	Hypospadias	Q54.0
42.	Indeterminate sex	Q56.0
43.	Urinary system	Q60-64 (can ask the doctor)
44.	Renal agenesis	Q60.0
45.	Renal Dysplasia	Q61.4
46.	Cystic kidney	Q61.0
47.	Congenital Hydronephrosis	Q62.0
48.	Obstructive genitourinary defect	Q62.0
49.	Musculoskeletal system	Q65-79
50.	Congenital hip dislocation	Q65.0-65.9
51.	Club foot-talipes equinovarus	Q66.0
52.	Polydactyly	Q69.0
53.	Syndactyly	Q70.0
54.	Total limb reduction defects	Q71.0
55.	Arthrogryposis multiplex congenital	Q74.3
56.	Craniosynostosis	Q75.0
57.	Achondroplasia/ hypochondroplasia	Q77.4
58.	Diaphragmatic hernia	Q79.0
59.	Omphalocele	Q79.2
60.	Gastroschisis	Q79.3
61.	Other and unspecified	Q80
62.	Chromosomal abnormalities	Q90-99 (can ask the doctor)

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