



OUTCOMES OF ANTENATALLY DETECTED HYDRONEPHROSIS IN A SINGLE CENTRE BETWEEN 2009 — 2020

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BACKGROUND

Incidence of significant structural anomaly by prenatal ultrasound detection is 1%. ([Grisoni et al., 1986](#))

20 – 30% are congenital anomalies of urinary system.

Variation of etiology and clinical outcome.

Prenatal detection provide expectant parents regarding the condition, etiology, available treatment, and prognosis.

LITERATURE REVIEW

Hydronephrosis is the most frequently detected anomaly on antenatal ultrasound with an incidence of 1-2%. (Hamilton et al, 2013)

Causes of antenatal hydronephrosis can't be determined before birth and is diagnosed postnatally with additional imaging. (Yamaçake & Nguyen, 2012).

Mild dilation at midtrimester ultrasound may resolve or remain stable in the later part of pregnancy or at postnatal scan. No clinical significance and do not require treatment nor prolonged surveillance in a tertiary centre (Cheng et al., 2004) (Maayan-Metzger et al., 2011).

Antenatal dilatation of the urinary collecting system could just simply be a dynamic and physiologic process which resolves spontaneously in **36-80%** of cases after birth (Sherer., 2000).

3rd trimester value of an **APRD > 7 mm** is the most widely used criteria in order to screen patients who may require post-natal investigation. (Ismaili et al., 2004).

Difficult decision to perform further postnatal investigations for parents and clinician alike. (Passerotti et al., 2011).

Various classification and grading systems have evolved in complexity over time. (Vallasciani et al., 2021).

In a systematic review of the literature, it appeared that the risk of urological pathologies increased with increasing degree of hydronephrosis (Passerotti et al., 2011).

Proportion of infants with ANH that required surgery were significantly higher, up to 52%. (Killi et al., 2017) (Paopongsawan et al., 2014).

Screening has become standard practice and guidelines are established including referral to MFM centres and a multidisciplinary approach of postnatal management in a tertiary centre in cases of moderate-severe ANH. (de Grauw et al., 2014) (Nguyen et al., 2014).

OBJECTIVE

To determine the causes of antenatally detected hydronephrosis in UMMC.

Evaluation of the findings at 3 months post delivery.

Determination of the outcome at most recent follow up.

To determine the incidence of antenatally detected hydronephrosis in UMMC.

Research question :

What are the factors that might help determine the outcomes of antenatally detected hydronephrosis?

MATERIALS & METHODS

Observational study.

Retrospective data collection.

Review of antenatal scans at UMMC fetomaternal unit and postnatal investigation.

- January 2009 to December 2020
- Multidisciplinary follow up and status
- Study endpoint in May 2022

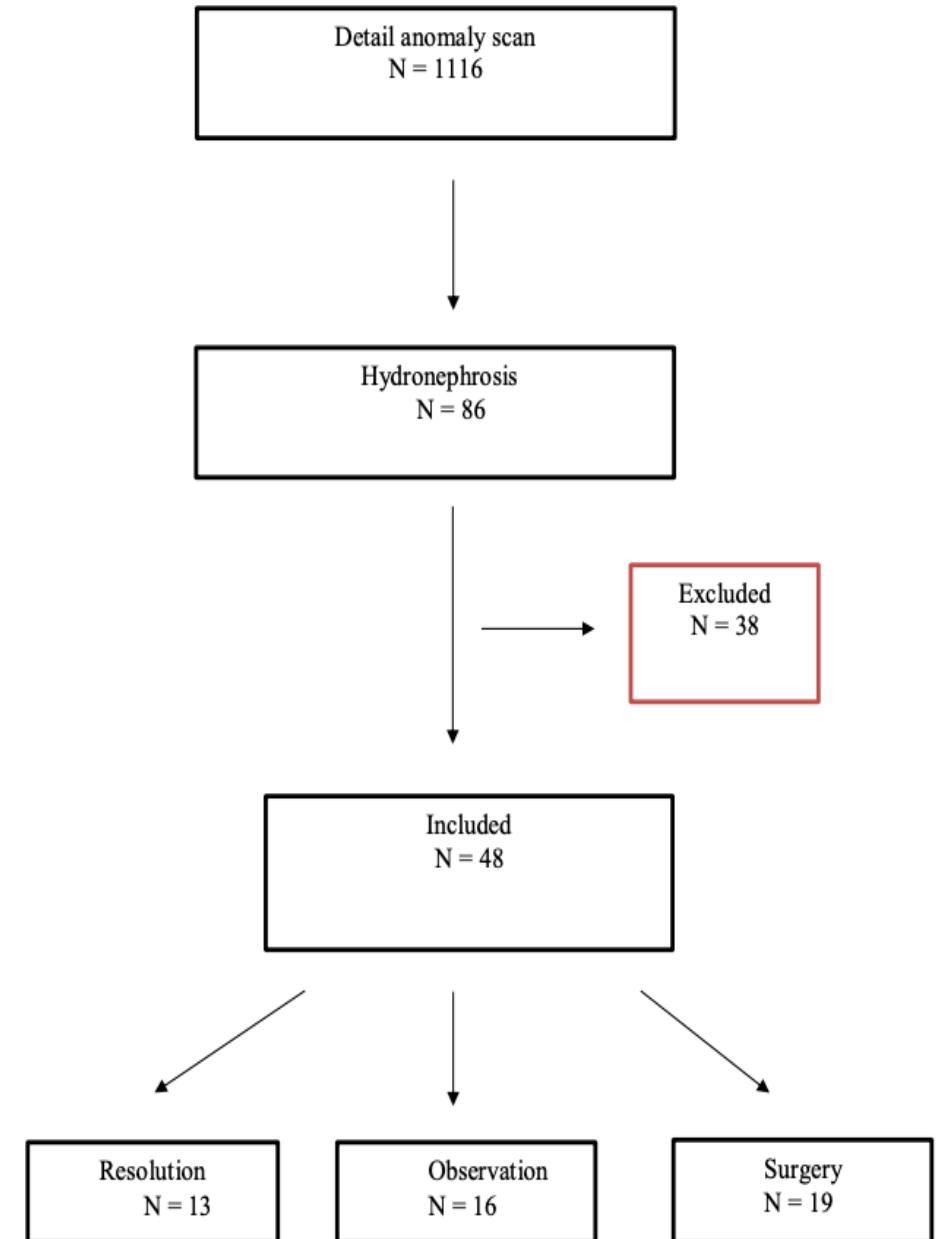
Odds ratio estimated using logistic regression model.

Receiver operating characteristic curve to determine predictor for postnatal surgery.

Incidence in UMMC

Year	Livebirths	Detail scan	Hydronephrosis
2009	4729	57	4
2010	5012	85	5
2011	5949	125	9
2013	6284	103	11
2014	6427	98	7
2015	5445	77	5
2016	5298	88	5
2017	5454	127	13
2018	6005	130	12
2019	5953	114	9
2020	3924	112	6
Total	60,480	1,116	86

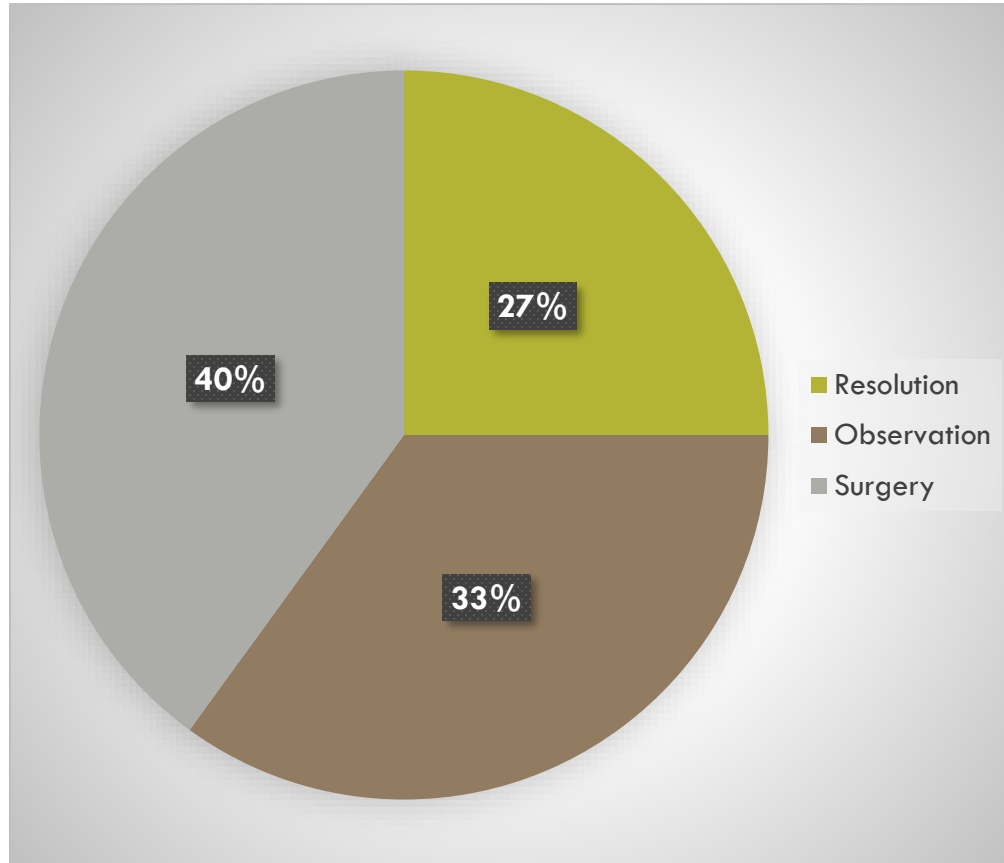
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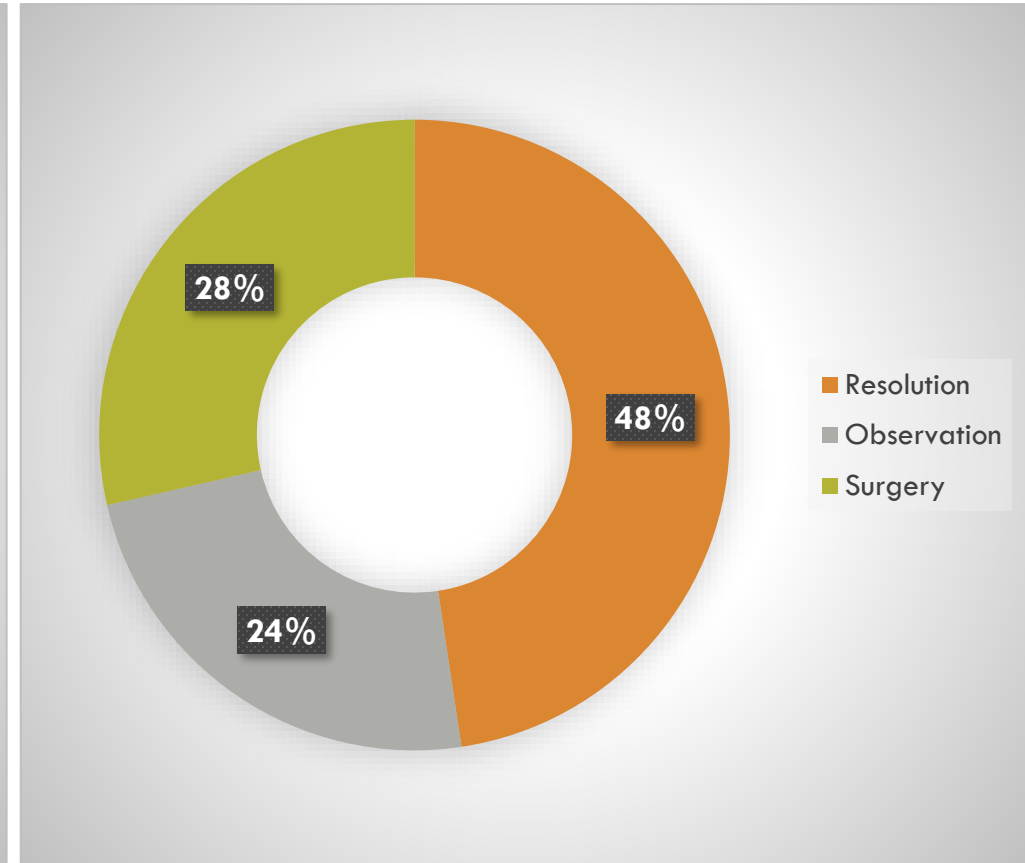
Demography

Variable	n (%) / mean \pm SD/ median (IQR)
Male/Female	32 (66.7) / 16 (33.3)
Birthweight (kilogram)	2.84 \pm 0.56
Gestational age at birth (weeks)	37.2 \pm 1.9
Gestational age at diagnosis (weeks)	29.6 \pm 4.2
Singleton/twin pregnancies	47 (97.9) / 1 (2.1)
Vaginal delivery/caesarean section	25 (52.1) / 23 (47.9)
Maternal age at birth (years)	31.7 \pm 4.3
Median age at 1st postnatal scan (days)	5 (1- 9)
Ethnicity	
Chinese	4 (8.3)
Malay	40 (83.3)
Indian	4 (8.3)
Parity	
Primigravida	22 (45.5)
Multigravida	20 (41.7)
Grandmultiparous	6 (12.5)
Comorbidity	
Nil	24 (50)
Gestational diabetes	15 (31.3)
Anaemia	3 (6.3)
Others	6 (12.5)
Affected kidney	
Right	13 (27.1)
Left	14 (29.2)
Bilateral	21 (43.8)
Referral center	
Government	26 (54.2)
Private	22 (45.8)
Prenatal scan (APD grade)	
Mild	9 (18.8)
Moderate	13 (27.1)
Severe	26 (54.2)

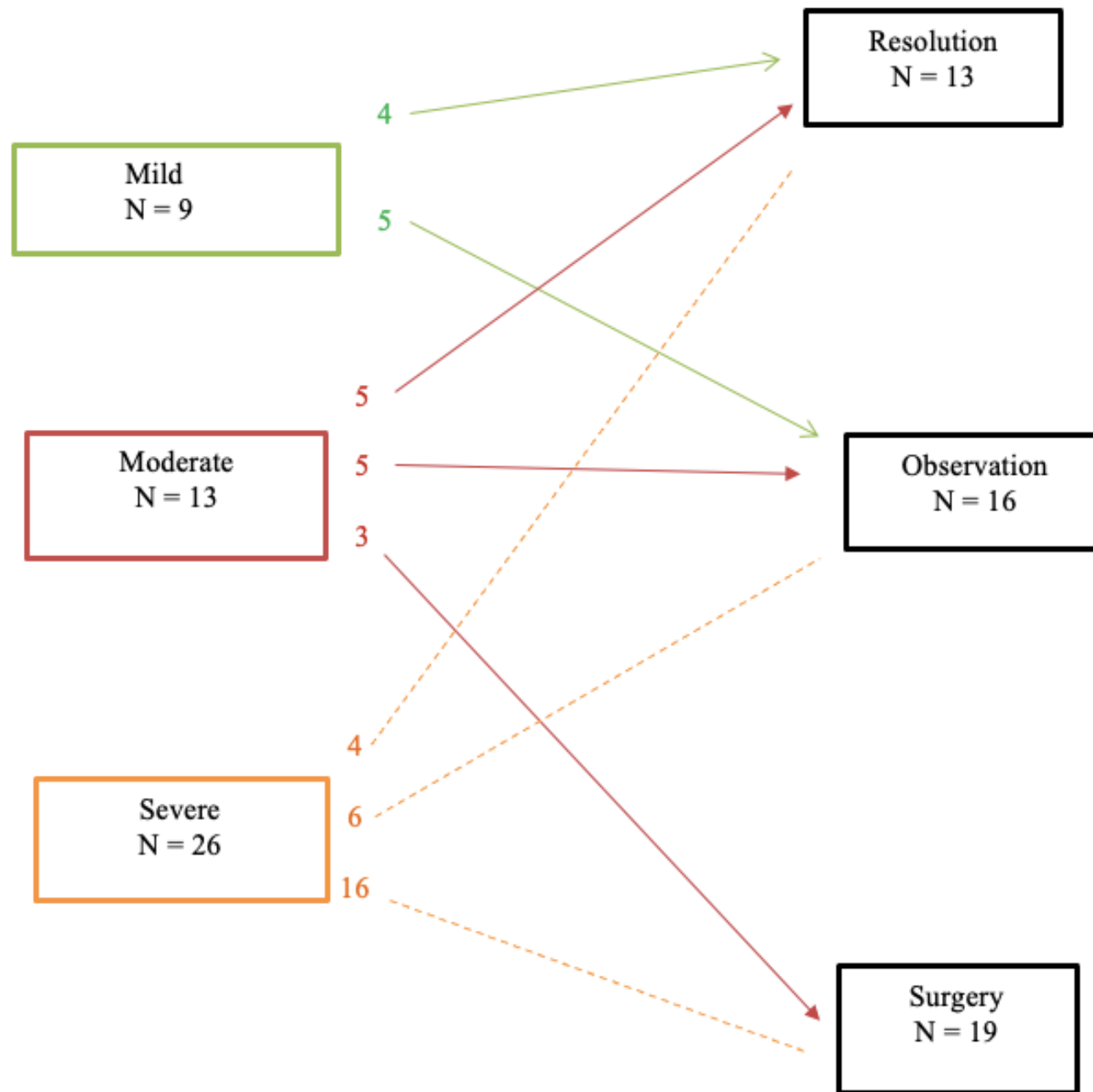
Outcomes of ANH



Outcomes for bilateral ANH



(N = 48)



Diagnosis	Affected renal units (N = 69)			Outcome		
	Right	Left	Bilateral	Resolution	Observation	Surgery
	N = 13	N = 14	N = 21	N = 13	N = 16	N = 19
Resolved hydronephrosis	0	3 (21%)	10 (48%)	13 (100%)	0	0
Persistent hydronephrosis	1 (8%)	3 (21%)	3 (14%)	0	7 (44%)	0
UPJ obstruction	5 (38%)	3 (21%)	4 (19%)	0	0	12 (63%)
MCDK	2 (15%)	0	1 (8%)	0	3 (19%)	0
Duplicated collecting system	0	1 (7%)	2 (10%)	0	1 (6%)	2 (11%)
Non functioning kidney	2 (15%)	0	1 (8%)	0	3 (19%)	0
PUV	0	1 (7%)	1 (8%)	0	0	2 (11%)
VUR	0	1 (7%)	0	0	0	1 (5%)
Dystrophic kidney	1 (8%)	0	0	0	0	1 (5%)
Ectopic kidney	1 (8%)	0	0	0	1 (6%)	0
VUJO	0	1 (7%)	0	0	0	1 (5%)
Megaureter	1 (8%)	0	0	0	1 (6%)	0

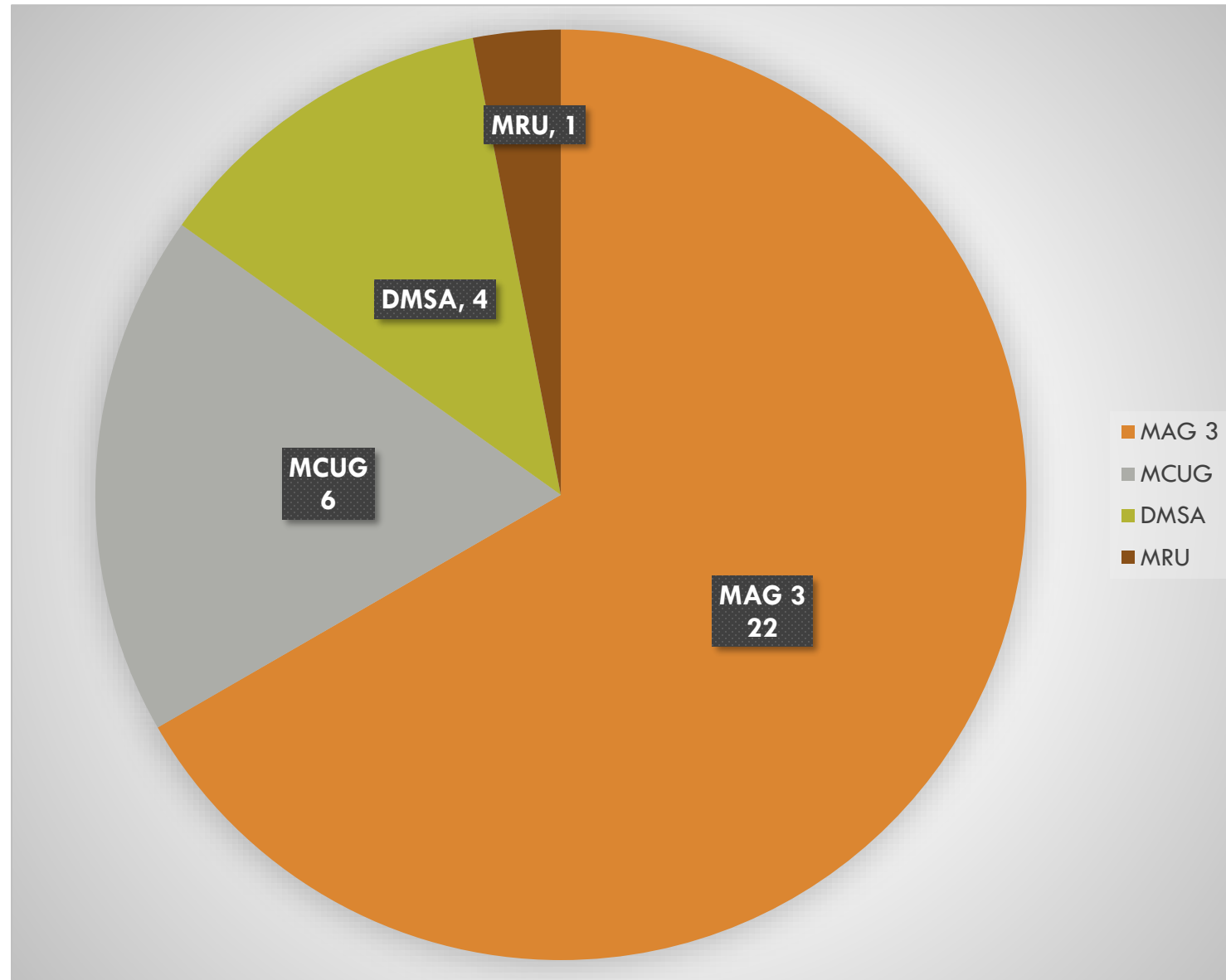
Eventual diagnosis

Diagnosis	n = 48 (%)
Resolved hydronephrosis	13 (27)
UPJ obstruction	12 (25)
Persistent hydronephrosis	7 (14.4)
MCDK	3 (6.3)
Duplicated collecting system	3 (6.3)
Non-functioning kidney	3 (6.3)
PUV	2 (4.2)
VUR	1 (2.1)
Dystrophic kidney	1 (2.1)
Ectopic kidney	1 (2.1)
VUJO	1 (2.1)
Megaureter	1 (2.1)

Diagnosis and type of intervention

Diagnosis	Surgical intervention	Type of intervention
	N = 19	
UPJ obstruction	12 (63%)	Pyeloplasty
Duplex	2 (11%)	Ureteric reimplantation and ureter – ureterostomy (n = 1) Resection of left upper moiety (n = 1)
PUV	2 (11%)	Fulguration (n = 1) Ablation (n=1)
VUJO	1 (5%)	Ureteric reimplantation
VUR	1 (5%)	Cystoscopy and deflux injection
Dystrophic kidney	1 (5%)	Nephrectomy

Radiological investigations other than US



Association between demography and eventual outcome

Parameter	Outcome			P - value
	Resolution	Observation	Surgery	
Gender				0.521
Male	10	11	11	
Female	3	5	8	
Maternal age (years)				0.937
< 35	9	12	14	
≥ 35	4	4	5	
APD grade				
Mild	4	5	0	0.012
Moderate	5	5	3	
Severe	5	6	16	
Laterality				
Unilateral	3	11	13	0.019
Bilateral	10	5	6	

Association between clinical characteristics and APD grade

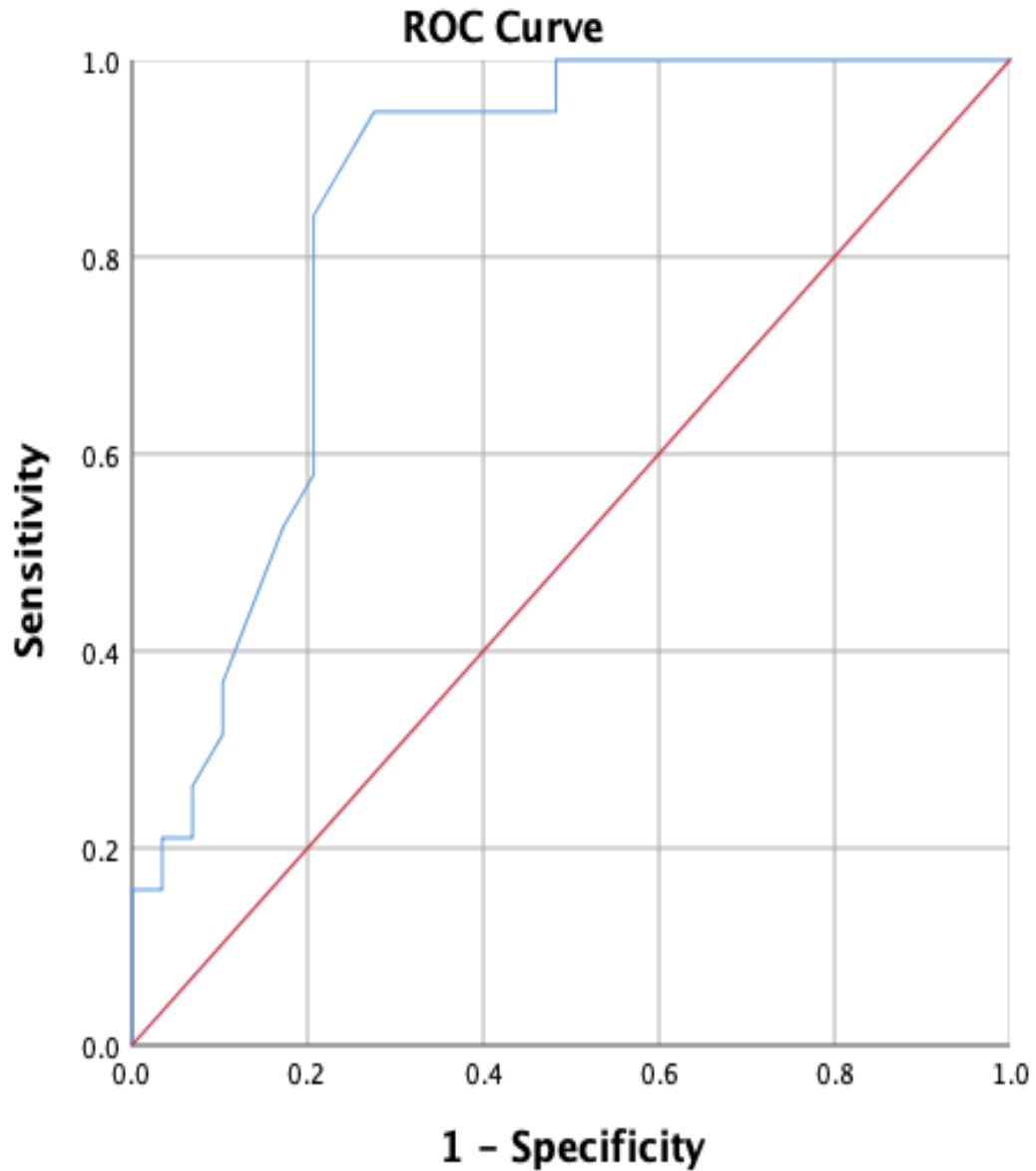
Characteristics	N = 48	APD grade			P value
		Mild N = 9 (%)	Moderate N = 13 (%)	Severe N = 26 (%)	
Ethnicity					
Malay	40	6 (67%)	11 (85%)	23 (88%)	0.282
Indian	4	2 (22%)	0	2 (8%)	
Chinese	4	1 (11%)	2 (15%)	1 (4%)	
Gender					
Male	32	6 (67%)	7 (54%)	19 (73%)	0.486
Female	16	3 (33%)	6 (46%)	7 (27%)	
Maternal age					
< 35	35	5 (56%)	10 (77%)	20 (77%)	0.429
≥ 35	13	4 (44%)	3 (23%)	6 (23%)	
Comorbidity					
No	24	4 (44%)	9 (70%)	11 (42%)	0.266
Yes	24	5 (56%)	4 (30%)	15 (58%)	
Parity					
Primigravida	22	6 (67%)	6 (46%)	10 (38%)	0.628
Multigravida	20	2 (22%)	6 (46%)	12 (46%)	
Grandmultiparous	6	1 (11%)	1 (8%)	4 (16%)	
Affected kidney					
Unilateral	27	4 (44%)	8 (62%)	15 (58%)	0.712
Bilateral	21	5 (56%)	5 (38%)	11 (42%)	

Univariate analysis

Parameters	Odds ratio	95% confidence interval	P value
Male gender	1.909	0.563 – 6.477	0.3
Non Malay	0.407	0.39 – 4.261	0.453
Unilateral affected kidney	0.431	0.128 – 1.446	0.173
Maternal age \geq 35 years	0.938	0.254 – 3.461	0.923
Birthweight $<$ 2.5 kg	1.391	0.303 – 6.398	0.671
Term delivery	0.891	0.236 – 3.365	0.865
No maternal comorbidity	0.591	0.184 – 1.907	0.377
Severe APD grade	6.564	1.565 – 27.538	0.01

Multivariate analysis

Parameters	Odds ratio	95% confidence interval	P value
Non Malay	0.141	0.088 – 5.301	0.055
Male	0.449	0.068 – 2.961	0.405
Unilateral affected kidney	0.375	0.073 – 1.911	0.238
Maternal age \geq 35 years	0.682	0.088 – 5.301	0.714
Severe APD grade	18.737	2.207 – 159.052	0.007
Birthweight < 2.5 kg	3.533	0.296 – 42.206	0.319
Term delivery	0.135	0.014 – 1.289	0.082
No maternal comorbidity	0.203	0.031 – 1.312	0.094



Parameter	OR	95 % confidence interval	P value
APD > 13 mm	60	5.498 – 655.825	0.001

ROC curve (AUC = 0.85)
Sensitivity 95%



18/19 patients required surgery

DISCUSSION

Lower incidence in our study – 0.2%.

Most common pathology – UPJ obstruction 25%.

27% of ANH resolved postnatally. Selectivity bias towards diagnosis of transient hydronephrosis.

Timing of first postnatal screening – 12 patients (25%) in first 24 hours of life.

Severity of ANH independently associated with postnatal outcome.

- 29 patients were recorded as having severe hydronephrosis during prenatal scan and **16 (55%)** required surgical intervention.
- Multivariate analysis found that larger APD independently predicted lower likelihood of ANH resolution. (Longpre et al., 2012)
- Higher grade had sensitivity of 59.4% and specificity of 86.4% for prediction of surgical outcome. (Kiener et al., 2018)

Laterality of affected kidneys and outcome.

- **Statistically significant** association.
- Bilateral hydronephrosis and requirement for surgical intervention. (Babu et al., 2010)

Limitations :

- Small cohort
- Incomplete data registry
- Absence of standardised protocol for evaluation of ANH.

Recommendations :

Involvement of **Neonatologists and Paediatric Urologists** during the **prenatal screening process** to achieve a standardised protocol and appropriate postnatal management.

Multicentre study in a **larger cohort** with standardised prenatal and postnatal protocols to define the prognostic ability of ANH.

SUMMARY

- ❑ Great majority of ANH are physiological. Most common pathology is UPJ obstruction.
- ❑ Children with any degree of ANH are at **greater risk of postnatal pathology** as compared with the normal population.
- ❑ Essential parameter quoted as a predictor for surgical intervention was a greater **degree of ANH**.
- ❑ Indication for surgery may be quantified by the measurement of APD.



THANK YOU