# THE EFFECT OF SYMPHYSIO-FUNDAL HEIGHT MEASUREMENT IN DETECTING MACROSOMIA AND PREDICTING SHOULDER DYSTOCIA IN HOSPITAL SULTAN ISMAIL, JOHOR BAHRU

BY

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# Abbreviations

| | |
|---|---|
| ACOG | American Association of Obstetrics and Gynaecology |
| SFH | Symphysiofundal Height |
| AFI | Amniotic Fluid Index |
| GDM | Gestational Diabetes Mellitus |
| EFW | Estimated Fetal Weight |
| HIE | Hypoxic Ischemic Encephalopathy |
| HSIJB | Hospital Sultan Ismail Johor Bahru |
| HUSM | Hospital Universiti Sains Malaysia |
| HSIAPPS | Hospital Sultan Ismail Application System |
| LSCS | Lower Segment Caesarean Section |
| RCOG | Royal College of Obstetrics and Gynaecology |
| SVD | Spontaneous Vertex Delivery |
| NICU | Neonatal Intensive Care Unit |
| cm | centimeter |

**ABSTRAK**

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**Kesan pengukuran ketinggian rahim ibu dalam mengesan ‘macrosomia’ dan meramalkan ‘shoulder dystocia’.**

Hasnurul Juma’ah Hasan, Ghazali Ismail, Ahmad Amir Ismail

**Objektif:** Untuk menilai nilai diagnostik pengukuran ketinggian rahim ibu dalam mengesan ‘macrosomia’ dan meramalkan 'shoulder dystocia'. Untuk menilai kejadian, faktor risiko dan komplikasi yang berkaitan dengan 'shoulder dystocia'.

**Metodologi:** Kajian prospektif keratan rentas di Hospital Sultan Ismail telah dijalankan dari 1 Jun 2015 hingga 30 September 2015 (4 bulan). Kajian melibatkan 961 wanita mengandung cukup bulan.Ketinggian rahim ibu dilakukan dan butiran antenatal, sewaktu kelahiran, selepas kelahiran dan rekod neonatal dicatat. Insiden ‘shoulder dystocia’ dinilai dan faktor-faktor risiko untuk ‘shoulder dystocia’ telah dianalisis oleh analisis regresi logistik.

**Keputusan:**Seramai 961 pesakit telah diambil dalam kajian ini. Insiden ‘shoulder dystocia’ adalah 0.04% (n = 42). Pengukuran ketinggian rahim ibupada nilai 40 cmuntuk bayi macrosomic (berat kelahiran 4000 g dan ke atas) terbukti berguna dengan sensitiviti 78.2% dan kekhususan 97.9%. Walaupun nilai ramalan positif adalah rendah pada nilai 48.6%, nilai ramalan negatif 99.4% memberi petunjuk yang berguna.Insiden‘shoulder dystocia’ meningkat dengan peningkatan ukuran ketinggian

rahim ibu (2 hingga 6 kaliganda) dan berat kelahiran (3 hingga 7 kaliganda). Apabila ketinggian rahim ibu (≥ 40 cm), insiden‘shoulder dystocia’ adalah 13.5% (5/37) berbanding dengan 2.3% (17/735) apabila ketinggian rahim ibu (<39 cm) dan 16% (20/126) dengan ketinggian rahim ibu (> 39 cm tetapi <40cm) masing-masing. Apabila berat kelahiran ≥ 4000gram, insiden‘shoulder dystocia’ adalah 21.7% (5/23) dan kaitan itu juga telah dicatat di dalam kelahiran berat dalam kumpulan ≥ 3800 hingga 3990gram (29.3%). Peningkatan insiden ‘shoulder dystocia’ meningkat daripada universal (4.0%) bermula dengan berat lahir ≥ 3600gram.Seramai 21 bayi dimasukkan ke NICU dengan 5 daripada mereka disebabkan tidak lengkap Moro Reflex dan 2 dengan skor Apgar yang rendah. Terdapat satu kes ibu mengalami koyakan perineal tahap tiga.

**Kesimpulan:**

Nilai 40 cm bagi pengukuran ketinggian rahim ibu untuk bayi ‘macrosomia’ (berat kelahiran 4000 g dan ke atas) terbukti berguna dengan sensitiviti 78.2% dan kekhususan 97.9%.

Walaupun insiden keseluruhan ‘macrosomia’ dan ‘shoulder dystocia’ adalah rendah, risiko ‘shoulder dystocia’ telah dikaitkan kepada peningkatan berat lahir dan ketinggian rahim ibu.

Faktor-faktor risiko yang dikaitkan dengan ‘shoulder dystocia’ di dalam kajian ini ialah ketinggian rahim ibu lebih daripada 40cm (n = 5, 11.9%) dan berat kelahiran lebih daripada 4000 gram. (n = 5, 11.9%). Walau bagaimanapun ‘shoulder dystocia’ boleh berlaku pada ketinggian rahim ibu ≥37cm dan berat kelahiran ≥3600gram. Garis

panduan antarabangsa untuk kes elektif caeserean dalam kes-kes yang disyaki ‘macrosomia’ tidak boleh diapplikasi kepada penduduk Malaysia.

## Abstract

**The effect of Symphysiofundal height measurement in detecting macrosomia and predicting shoulder dystocia.**

Hasnurul Juma'ah Hasan, Ghazali Ismail, Ahmad Amir Ismail

**Objective:** To assess the diagnostic value of Symphysiofundal height measurement in detecting macrosomia and predicting shoulder dystocia at term. To determine the incidence, risks factors and complications associated with shoulder dystocia.

**Method:**A prospective cross sectional study in Hospital Sultan Ismail was conducted from 1st June 2015 until 30th September 2015 (4 months).The study included 961 pregnant women with singleton fetus completed 37 weeks. Symphysiofundal height measurement was done and the detailsregarding the antenatal review, intrapartum events, immediate postpartum event and neonatal outcome were recorded. The incidence of shoulder dystocia was assessed and risk factors for shoulder dystocia were examined by multiple logistic regression analysis.

**Results:**A total of 961 patients were recruited in this study. Incidence of shoulder dystocia was 0.04% (n=42). The SFH measurement of 40 cm cut-off value for macrosomic babies (birth weight of 4000 g and above) proved to be useful with sensitivity of 78.2% and specificity of 97.9%. While the positive predictive value was

poor at 48.6%, the negative predictive value of 99.4% provided a useful indicator. The incidence of shoulder dystocia rose with increasing SFH measurement (2 to 6 fold) and birthweight (3 to 7 fold). When the SFH (≥ 40cm), the incidence of shoulder dystocia was 13.5% (5/37) as compared to 2.3% (17/735) when SFH (< 39cm) and 16 %( 20/126) with SFH (>39cm but <40cm) respectively. When the birth weight ≥ 4000gram, the incidence of shoulder dystocia was 21.7% (5/23) and the association was also noted when birth weight ≥ 3800 to 3990gram group (29.3%). The incidence noted to be increased from the universal (4.0%) starting with the birth weight ≥ 3600gram. A total of 21 babies admitted to NICU with 5 of them with incomplete Moro Reflex and 2 with low Apgar score. There was one case of maternal third degree perineal tear.

**Conclusion:**

The 40 cm cut-off for macrosomic babies (birth weight of 4000 g and above) proved to be useful with sensitivity of 78.2% and specificity of 97.9%.

Although the overall incidences of macrosomia and shoulder dystocia were low, the risk of shoulder dystocia was strongly linked to increasing birthweight and SFH measurement.

The only reliable risks factors associated with shoulder dystocia in this study were symphysio fundal height measurement more than 40cm (n=5, 11.9%) and birth weight more than 4000 gram. (n=5, 11.9%). However shoulder dystocia can occur at SFH measurement ≥37cm and birth weight of ≥3600gram.International guidelines for elective caesarean delivery in suspected cases of macrosomia may not, therefore, apply to Malaysian population.

# 1.0 INTRODUCTION

## 1.1 About Hospital Sultan Ismail Johor Bahru (HSIJB)

Hospital Sultan Ismail (HSI) is a government tertiary referral hospital, located in Johor Bahru town. This specialist hospital equipped with THIS (Total Hospital Information System) which is a fully computerized system.

The Department of Obstetrics and Gynecology was first established in 2006. This department has one labor suite equipped with 17 beds including 4 HDU suites, one pregnancy assessment center (PAC) or Bilik Saringan which equipped with 6 beds, one Maternity theatre, four wards with 112 beds and 1 specialist clinic.

The total number of deliveries is increasing from 5249 in year 2007 to 11520 in year 2013, with an average of 800 to 1000 deliveries per month.

## 1.2 Study Introduction

According to Williams Obstetrics, competent clinical examination should enable examiners to arrive at fairly accurate fetal weight conclusions. This is an easy screening method for everyone to follow uterine growth.

Symphysio-fundal height (SFH) cut-off value of 40 cm has good sensitivity and specificity for predicting a birth weight of 4000 g or more. The greatest strength of this cut-off was its negative predictive value (99%). This means that a SFH of less than 40 cm in a woman in the active phase of labour at term gives 99% likelihood that the new born will weigh less than 4000 g (Buchmann, 2009).

Vaginal delivery of macrosomic infants is generally associated with increased risk of operative delivery, shoulder dystocia, neonatal asphyxia, and subsequent hypoxic ischemic encephalopathy (HIE). Associated birth trauma, particularly injuries to the brachial plexus can be permanent and are often a cause of litigation.

ACOG practice bulletin in 2002 and the RCOG green guideline in 2005 are in agreement on the descriptor of shoulder dystocia: requirement of additional obstetric manoeuvers when gentle downward traction has failed to affect the delivery of the shoulders.

The rate of shoulder dystocia is about 1.4% of all deliveries and 0.7% for vaginal births (Hansen, 2014).

The occurrence of shoulder dystocia increased in direct relationship to the birth weight and becomes significant in new-borns over 4000 grams.

Shoulder dystocia is not always preventable or predictable; however, in most severe cases, there are often well-defined risk factors or events that could have been identified during the antepartum and intrapartum periods.

The care provider must be alert to this problem in those women with significant risk factors.

There are some factors commonly associatedwith shoulder dystocia. These include macrosomia, diabetes in themother, assisted deliveries, high parity, prolonged labor andprolonged second stage. But again, these are common obstetricproblems seen in daily practice and, in the majority of these,shoulder dystocia do not occur.

Furthermore, even though therecurrence rate of shoulder dystocia is ten times higher than the rate for the general population, the prediction rate in those cases isstill low.

Malaysian women have different maternal habitus, demographic factors, and birth weight distribution than western women. As a consequence, extrapolating the birth weight thresholds for various interventions on the basis of evidence generated from western populations may not be appropriate for Malaysian women, who tend to be shorter and smaller than their western counterparts.

The aim of the present study is to assess the incidence of macrosomia (defined as a birth weight ≥4000 gram) among a cohort of Malaysian women and to determine whether birth weight affected the risk of shoulder dystocia.

Established risk factors for shoulder dystocia were also examined to determine their applicability among Malaysian women. It was anticipated that the findings would help clarify the relationship between macrosomia and shoulder dystocia and provide a rational basis for clinical management of macrosomia in this population.

This study was done to evaluate the diagnostic value of symphysiofundal height measurement in detecting macrosomia and predicting shoulder dystocia. Hopefully this study will encourage more centres in Malaysia to do similar studies or audit so that the diagnostic value of symphysiofundal height measurement will be more accurate and significant.

# 2.0 LITERATURE REVIEW

Mothers experiencing higher symphysio-fundal measurements at term have a much higher incidence of shoulder dystocia. Fundal height is an easy screening method for everyone to follow uterine growth.

It gives us a suspicion of macrosomia (absolute birthweight) and identifies mothers needing ultrasound exams. In these patients, the use of ultrasound has been shown to be the best method to predict fetal weight and document excessive fetal growth weights.

Pattawan *et al* (2010) found out that symphysio-fundal height measurement is an effective screening test to predict new-born with low birth weight at the cut point of < 30 cm and high birth weight at the cut point of > 38 cm.This test was appropriate for screening because it is simple, widely available, non-invasive and cheap.

Frequent clinical estimations of fetal weight may help to select appropriate candidates for cesarean section delivery without a trial of labor. When a patient is admitted in labor or for induction of labor, the abdominal examination should include the fundal height measurement.

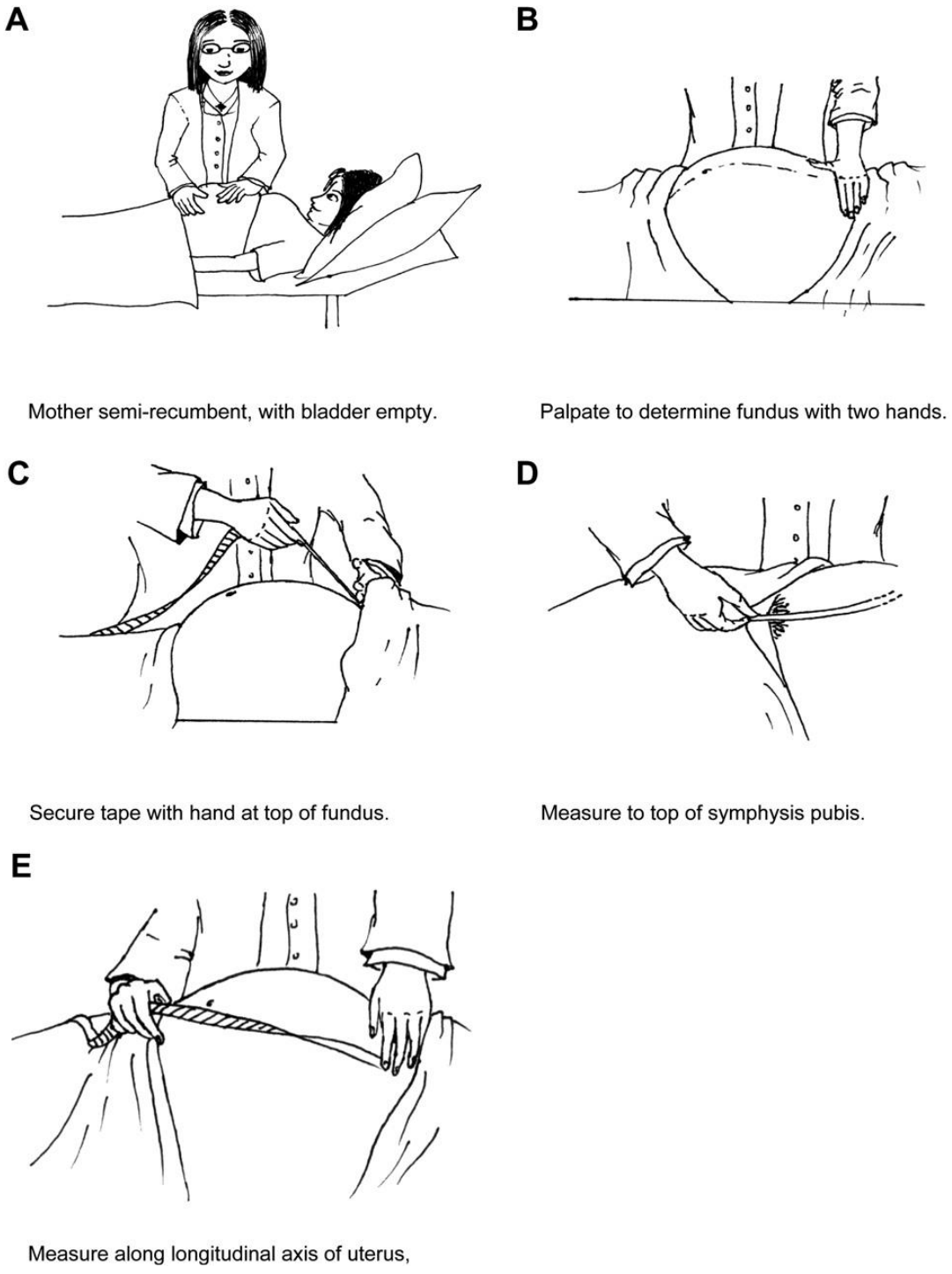


**Figure 2.1 Symphysiofundal Height Measurements**

As the measurement approaches 40 cm or greater, the risk of having a baby that weighs more than 3600gramsbecomes more likely, and problems such as cephalopelvic disproportion or shoulder dystocia become increasingly more common.

Neiger *et al* (1992) emphasized the importance of fundal heightmeasurements above 40 cm and recommended cesarean section if a high level of suspicion for macrosomia is reasonable.

Combs *et al* (2000) agreed that most fetal weight prediction studies for macrosomia choose 4000grams and above as the definition of macrosomia or select high-prevalence populations, such as women with diabetes mellitus or who are post-dates, thus improving the positive predictive value (PPV) of the test.

In one study, in patients who had fundal measurements at term that were above the 90th percentile (in which the relationship between the maternal height and the symphysis-fundal height were adjusted); there was a higher incidence of abnormal labor and operative delivery. These patients and fetuses experienced an increased amount of shoulder dystocia, meconium aspiration, birth asphyxia, brachial plexus injuries, and midforceps deliveries.

Gonan *et al* (1999) concluded that the ability to predict macrosomia is limited. The predictive value of clinical estimation of fetal weight alone may be slightly higher than when it is combined with ultrasonography. Because most cases of shoulder dystocia and

birth trauma occur in non macrosomic infants, these conditions are practically impossible to prevent

Ultrasound has a maximum random error of approximately 100 g/kg, which means that weight predictions in grams for small fetuses appear to be more clinically useful. Indeed, many researchers have found ultrasound prediction of macrosomia to be inaccurate and of little clinical value.

In the spontaneous delivery of an averaged sized or relatively small infant, theshoulder will usually deliver immediately after the head, during the same contraction. As fetal size increases relative to pelvic size and shape, the stepwise sequential cardinal movements of normal labor are more easily appreciated, with spontaneous delivery of the shoulders following external rotation of thehead by the next contraction

Shoulder dystocia, the doctor's dilemma, represents many things to the obstetrician: fear when it occurs; possible frustration when trying to prevent it; and a formidable problem when preparing a legal defense if litigation ensues.

ACOG practice bulletin in 2002 and the RCOG green guideline in 2005 are in agreement on the descriptor of shoulder dystocia: requirement of additional obstetric manoeuvers when gentle downward traction has failed to affect the delivery of the shoulders.

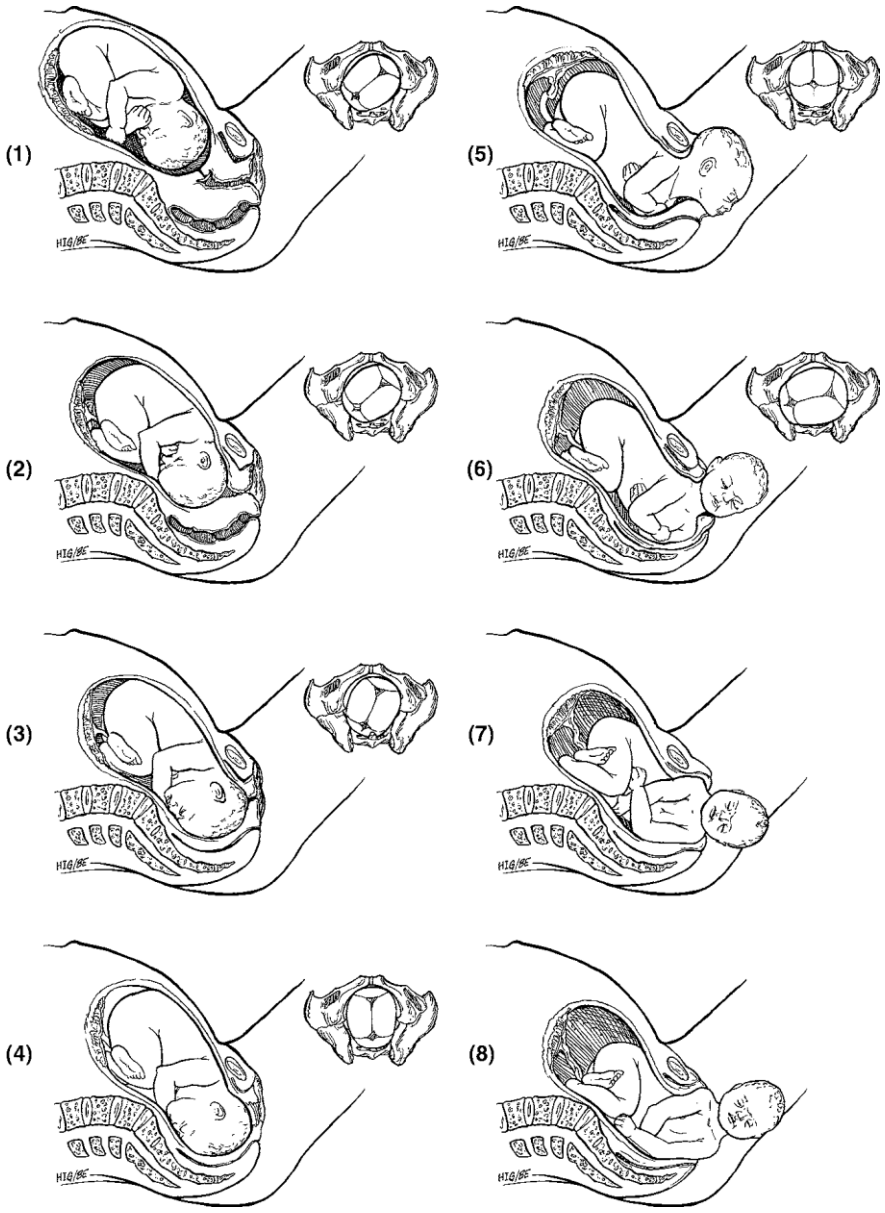


**Figure 2.2 Cardinal movements of normal labor.**

(1) Head floating, before engagement. (2) Engagement, flexion descent. (3) Further descent internal rotation. (4) Complete rotation, beginning extension. (5) Complete extension, head emerges. (6) Restitution (external rotation). (7) Anterior shoulder appears under pubic bone. (8) Posterior shoulder delivers

Definitions of shoulder dystocia may vary slightly among institutions. However, most investigators agree that it has occurred when the standard delivery procedures of gentle downward traction of the fetal head fail to accomplish delivery. The problem with this definition is that the qualifier gentle lacks precise definition.

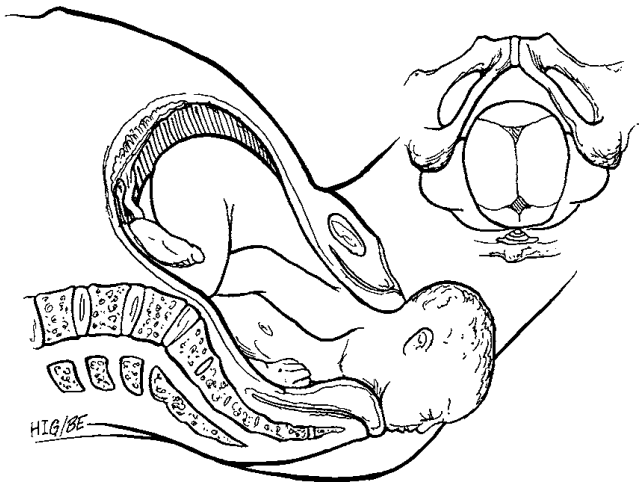


**Figure 2.3Turtle sign in funnel pelvis (shoulders transversely oriented)**

**Figure 2.4 Turtle sign**

When dystocia is marked, the shoulders may be held high in the pelvis. The head may be delivered gradually and with difficulty. Immediately after its delivery, the head is pulled back tightly against the perineum so that even rotation of the head is difficult. This is true and undisputed bilateral shoulder dystocia.

An extremely short umbilical cord, or a cord that is somewhat short and also is wrapped several times around the infant's neck, may make it difficult to deliver the shoulders. Brachial plexus is subject to injury when excessive downward traction and lateral flexion or extension of the fetal head and neck occur in an attempt to deliver the anterior shoulder.

Developments in obstetrics over the past 50 years have been largely directed at preventing asphyxia and trauma at the time of birth. Levine *et al* (1984) concluded that these changes have resulted in almost complete elimination of perinatal death (0.6 per 1,000) and permanent cerebral handicap (0.5 per 1,000) caused by peripartum asphyxia and trauma.

The incidence of dystocia may be difficult to establish unless large numbers of obstetric deliveries are considered. Also, there may be different criteria among different reporters and among different populations. It seems clear that the incidence is less than 1% of term deliveries, with 0.3% probably being an accurate determination. Gonik *et al* (1991) reported that shoulder dystocia is underreported in the obstetric literature; 71% of all injured infants were the product of deliveries where shoulder dystocia was not recognized.

The simplest and easiest approach to shoulder dystocia is prevention. Identification of critical risk factors will lead to anticipation, which in turn will lead to prevention. The risk factors for shoulder dystocia can be divided into preconceptual risk factors, antepartum risk factors, and intrapartum risk factors.

Thus, prevention requires identification of risk factors, which leads to anticipation of the problem.

More than 70% of shoulder dystocia cases occur with infants weighing more than 4,000 g Golditch *et al* (1978). With macrosomia and/or continued fetal growth beyond term, the trunk, and particularly the chest, grows larger relative to the head. The chest circumference exceeds the head circumference in 80% of cases. The arms also contribute to the greater dimensions of the upper body.

Within a barely adequate pelvis, such bulk might easily block fetal rotation from a disadvantageous anteroposterior to the more desirable oblique diameter and thus increase the frequency of the problem.

The University of Southern California series also demonstrated that shoulder dystocia occurred in only 1.2% of infants weighing more than 4000grams if prolonged second stage of labor and midpelvic delivery were not complicating factors

Any maternal or fetal factor that contributes to an increased incidence of macrosomia will increase the incidence of shoulder dystocia and brachial plexus.

It is evident that as women continue to develop greater obesity, as well as greater weight gain during the pregnancy, macrosomia has also continued to increase, thus making prevention of shoulder dystocia a more significant issue. Four factors remain assignificant contributors to shoulder dystocia: macrosomia, obesity, diabetes and operative delivery.

Gestational diabetes is associated with fetal macrosomia, cesarean delivery, preeclampsia, neonatal hypoglycemia, and perinatal death

Diabetic macrosomia leads to an increased rate of operative deliveries,perinatal asphyxia, and traumatic skeletal and nerve injuries. As a result of the disproportionate overgrowth of insulin-sensitive organs, and the greaterbody size compared with head measurement, macrosomic fetuses of diabeticmothers are at greater risk of birth trauma. In addition, these infants have thepotential risk of late diabetes-related sequelae.

Elliot *et al* (1982) reported that the shoulder, shoulder-head, and chest-head circumferences are significantly higher among infants with birthweights of 4000grams or more who had shoulder dystocia than among similar-weight babies delivered without such trauma, even when infants of diabetic mothers were excluded.

The incidence of this complication in deliveries of diabetic mothers was 50%, 23%, and 9% for infants weighing 4,500 g or more, 4,000 to 4,499 g, and 3,500 to 3,999 grams, respectively, compared with 23%, 10%, and 2% for deliveries of nondiabetic mothers.

The incidence of shoulder dystocia in non-diabetic gravidas vaginally delivering an infant weighing 4,000 to 4,499 g or more than 4,500 g is 10.0% and 22.6%, respectively.

A 1995 research report demonstrated that elective cesarean section for infants in excess of 4,000 g would prevent 44% of shoulder dystocias, increase the cesarean section rate by 2%, and halve the perinatal mortality with shoulder dystocia.

Conway *et al* (1998) concluded that and elective cesarean section for ultrasonic-proven macrosomia will reduce shoulder dystocia in diabetic women with a reduction from 10.2% to 1.4%.

Study by Asmah *et al* (2010) concluded that previous delivery of more than 3500 grams; prolonged labour and prolonged second stage were not associated with shoulder dystocia. Although diabetes and instrumental delivery were independently and significantly associated with shoulder dystocia their importance as a predictor became relevant only in the presence of macrosomia.There were 36 cases of shoulder dystocia during the study period, an incidence of 4%.

Birth weight, diabetes, and labour abnormalities were the principal contributors to shoulder dystocia and elective caesarean section is strongly recommended for diabetics with fetal weights ≥4250 grams, and trial of vaginal delivery for non- diabetic fetuses with weights ≥4000 grams is recommended (Langer *et al* 1991).

When prolongation of the second stage of labor occurred with midpelvic delivery, the incidence of shoulder dystocia increased to 4.5%. When prolongation of the second stage of labor was accompanied by midpelvic delivery and an infant weight of more than 4,000 g, the incidence of dystocia increased to 21%.

The McRoberts maneuver is widely recommended to be used early in the course of management. It involves flexing the mother's thighs against her abdomen. This approach appears to be helpful in many instances

Macrosomic compared with non-macrosomic infants delivered after shoulder dystocia are at a higher risk of obstetric brachial plexus injury (OBPI). Raio *et al*(2004) stressed the importance of short maternal stature as an associated risk factor in predicting birth injury.

It should also be noted that persistent OBPI is six times more common when the birth weight is ≥4000gramg compared with <4000gram and although the risk of shoulder dystocia is increased

**Figure 2.5The McRoberts position.**

**(From Gabbe S, Niebyl J, and Simpson JL. Obstetrics.Normal and Problem Pregnancies. New York: Churchill Livingstone; 1986.)**

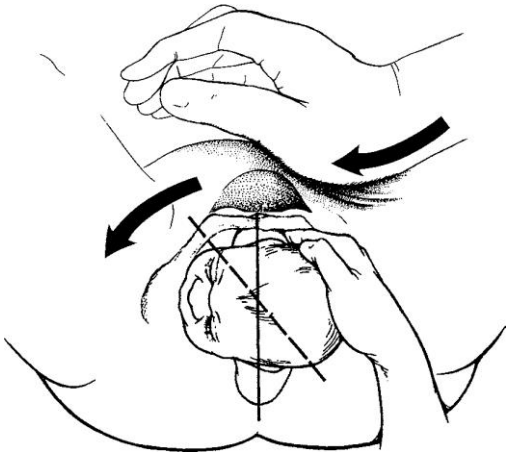

**Figure 2.6Suprapubic pressure in association with Rubin rotation of the anterior shoulder.**

The significant increase in the rate of shoulder dystocia is associated with complications such as fetal asphyxia, meconium aspiration, and birth trauma. Head trauma can range in severity from a minor injury to intracranial hemorrhages. These fetuses have a higher rate of broken clavicles and humerus, peripheral nerve injuries of the cervical or brachial plexus, and/or facial palsies.

These injuries may be permanent, as in Erb-Duchenne palsy, or even life threatening in cases of unilateral phrenic nerve paralysis

The major pitfalls encountered by the obstetrician relate to the failure to beprepared for and to optimally manage shoulder dystocia. Preparation isobviously important when risk factors exist although it must be borne inmind that shoulder dystocia may develop unexpectedly in the absence of any demonstrable risk factors

Fetal macrosomia is associated with increased risks for the mother, including emergency Caesarean section (CS),instrumental delivery, shoulder dystocia and trauma tothe birth canal, bladder, perineum and anal sphincter for the baby, complications include increased mortality, brachial plexus or facial nerve injuries, fractures of the humerus or clavicle and birth asphyxia.

Newborn brachial plexus palsy is one of the most common sources of obstetric malpractice litigation. The average settlement cost for cases of this sort is substantially higher than that of obstetric medical negligence suits in general.

# 3.0 OBJECTIVES

## 3.1 General and Specific Objectives

### General Objective

To assess the diagnostic value of symphysio fundal height measurement in detecting macrosomia and to determine the incidence of shoulder dystocia and its complication.

### Specific Objectives

1. To determine the sensitivity, specificity and predictive value of SFH measurement in detecting fetal macrosomia.
2. To determine the incidence of shoulder dystocia.
3. To identify the risks factor associated with shoulder dystocia.
4. To identify the complications of shoulder dystocia.

## 3.2 Hypothesis

There is a significant association between symphysio-fundal height measurement in detecting macrosomia and prediction of shoulder dystocia.

Null hypothesis

There is no significant association between symphysio-fundal height measurement in detecting macrosomia and prediction of shoulder dystocia.

## 3.3 Definition of Operation Terms

| | |
|---|---|
| ***Maternal Age*** | Completed years at time of delivery |
| ***Gestational Age*** | Estimated from the date of last menstrual period and amended by means of ultrasonography in some women in week 16-20 (for those who are unsure of date) |
| ***The Body Mass Index*** | Weight (kg)/height $(m)^2$ (before pregnancy), categorized as:<br>▪ Underweight (BMI<18.5)<br>▪ Normal (BMI = 18.5 – 24.9)<br>▪ Overweight (BMI =25 – 29.9)<br>▪ Obese (BMI>30) (WHO 2004) |
| ***Term Pregnancy*** | Gestational age from 37 completed weeks of gestation to 42 weeks |
| ***Post term Pregnancy*** | Pregnancy, which exceeds 294 days from first day of the last menstrual periods (FIGO 1980) |

| | |
|---|---|
| ***Diabetes in pregnancy*** | Women who confirmed diabetics or those were proven to have the disease in the present pregnancy by a positive oral glucose tolerance test. |
| ***Symphysiofundal Height*** | Measured from the top of the pubic bone, passed above the umbilicus to the top of the fundus by turning the centimeter side of the tape down. |
| ***Induction of labor*** | Initiation or augmentation of the process of parturition by mechanical or pharmacological methods |
| ***Instrumental delivery*** | Delivery of baby by forceps or the ventouse. |
| ***Macrosomia*** | Macrosomia was defined as any baby weighing 4 kg or more |
| ***Shoulder Dystocia*** | Any delivery that requiredadditional manoeuvers to release the shoulder after gentle downward traction had failed, irrespective of whether or not themother was already in the lithotomy position. |

***Moro reflex***

An infantile reflex normally present in all infants/newborns up to 3 or 4 months of age as a response to a sudden loss of support, when the infant feels as if it is falling. It involves three distinct components:

1. spreading out the arms (abduction)
2. unspreading the arms (adduction)
3. crying (usually)

***Apgar score***

A method of determining an infant's condition at birth by screening heart rate, respiratory effort, muscle tone, reflex irritability and colour. The infants is rated from 0 to 2 on each of the five items, the highest possible being 10

| Apgar Score | 0 | 1 | 2 |
|---|---|---|---|
| Heart Rate (beats/min) | Absent | Less than 100 | More than 100 |
| Respiratory Effort | Absent | Slow, irregular | Good cry |
| Muscle Tone | Limp | Some flexion | Active action |
| Reflex/Irritability | No Response | Grimace | Cry |
| Colour | Pale | Body pink, extremities blue | All pink |

# 4.0 METHODOLOGY

## 4.1 Study Setting

The study was conducted in HSIJB between 1st June 2015 and 30th September 2015 (4 months). It is a well-equipped hospital with excellent quality services and latest technology. It is one of the teaching and referral hospitals for people in South East of Penisular Malaysia.

## 4.2 Study Design

This was a prospective cross sectional study and was approved by Medical Research and Ethics Committee, Ministry of Health, Malaysia.

## 4.3 Study population

Woman who presented for spontaneous or induced labor with the aim of vaginal delivery in the labor room of HSIJB were recruited based on the inclusion and exclusion criteria.

**4.4 Sample Size Calculation**

a) Sample size was calculated using Power and Sample Size (PS) software whereby:

Formula

$$n = \frac{p_1(1-p_1) + p_2(1-p_2)}{(p_1-p_2)^2} \; X \; (Z\alpha + Z\beta)^2$$

Significance level($\alpha$)= 0.05

Power of study = 80%

Confidence Interval (CI) is 95%.

$Z\alpha = 1.96$ and $Z\beta = 0.84$

$p_2$ = 0.040 (based on previous study- incidence of shoulder dystocia, 4.0%)

$p_1$ = 0.069 (expected proportion based on expert opinion)

Sample size = 950

Expected 20% drop out = 192

Total patient 950+192 = 1142 subjects

Considering 20% drop out rate, the estimated sample size was at least 1142 subjects.

So a total of 1142 patients were recruited for this study.

After excluded those who underwent Caesarean section (181 patients), only 961 patients were analyzed in this study. (1142-181=961).

(Based on study by Asmah Mansor, Kulenthran Arumugam, Siti Zawiah Omar). Macrosomia is the only reliable predictor of shoulder dystocia in babies weighing 3.5 kg or more. European Journal of Obstetrics & Gynaecology and Reproductive Biology 2010; 149:44-46.