# A Synthesis of Literature on the Timing, Clamping, and Cutting of Umbilical Cord in Newborn Babies

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#### To cite this article

Salihu Dauda, Chutiyami Muhammad. A Synthesis of Literature on the Timing, Clamping, and Cutting of Umbilical Cord in Newborn Babies. *International Journal of Nursing and Health Science*. Vol. 3, No. 5, 2016, pp. 37-42.

Received: September 10, 2016; Accepted: September 22, 2016; Published: October 15, 2016

### Abstract

Timing and clamping of umbilical cord remain one of the apparent but unresolved issues in midwifery and obstetric practices, with some literature favouring late clamping (more than1minute) and others immediate clamping (less than1minute). This study aims to analyze evidence surrounding timing of clamping umbilical cord in order to arrive at a conclusion with the evidence that is more appealing. A literature review method was adopted in synthesizing the available evidence. Educational databases searched include MEDLINE, CINAHL, British Nursing Index and Google scholar, out of which 11 articles were selected in line with the inclusion criteria. It was identified that delayed umbilical clamping is more evidenced-based and beneficial practice to both the newborn babies and their mothers. Hence, this study recommends clamping of the umbilical cord after1minute of delivery.

## Keywords

Umbilical Cord, Early, Delay, Clamping

# 1. Introduction

The umbilical cord is a tube that connects the mother and the foetus; it provides nutrients and other factors needed for survival of the baby during intrauterine life [29] [14]. The timing of umbilical cord clamping remains one of the apparent but unresolved issues in midwifery and obstetric practices [20] [2] [29] [14]. However, before the emergence of scientific facts, in1801 Mr. Darwin reported that umbilical cord should be clamp in the absence of cord pulsation, and that prompted many researchers to explore the benefits of timing cord clamping [22] [29]. Furthermore, there is a huge debate regarding optimal umbilical cord timing without a unified standard [20] [3] [21] [11] [29].

Umbilical cord timing refers to the period at which the cord is clamp and cut [21] [2]. In like manner, [29], categorized it in to late clamping (more than1minute) or immediate clamping (less than1minute). Consequently, early clamping is said to be the most acceptable practice in the West despite many research findings supporting delayed

clamping [27] [11] [13]. The most compelling evidence is the outcome of the study by [30], who conducted an observational study on a global scale and concluded that 79.4% of practitioners practices early cord clamping.

The clamping of umbilical cord was not related to the circulatory transition in a newborn baby and clamping time is subject to individual judgment without restriction [5] [14]. It is a usual practice for an umbilical cord to be clamped and cut the moment the baby is born, but it was not justified as the best practice [11] [15] [5]. Similarly, [27, p. 488] submitted that "Although, without clear benefit and no rationale to support it, early cord clamping remains the most common practice among obstetricians and midwives in the western hemisphere." This practice deprived a newborn baby certain amount of blood which [8] estimated it to be around 24-40% (average 30%). Equally important, 2-5 minutes are needed for effective transfusion between the mother and the newborn baby after delivery because at birth 2/3 blood is within his /her body while 1/3 is within the placenta and the cord [5].

Must be remembered, in an intervention review study of

11trials by [16], about 2,989 women and their newborn babies were studied, and the result showed no differences between late (delayed) and early (immediate) umbilical cord clamping about postpartum haemorrhage and maternal complications. Alternatively, [17] reported in a similar randomized control trial involving 15 trials group of 1,912 women and their newborn babies whose age is less than 24hours of life, and the result showed no difference regarding mortality outcomes in both early and delayed clamping. However, systematic review evidence shows significant benefits for those with late clamping and cutting of umbilical cord [14]. On the contrary, [13] are of the opinion that the time for clamping and cutting umbilical cord has changed from delayed to immediate clamping in the 20<sup>th</sup> century. Under these circumstances, [15] stated that immediate clamping and cutting of umbilical cord resulted in the baby losing the amount of blood circulating in the umbilical cord, and the placenta (placental transfusion) as shown in Figure1.



Fig. 1. Physiologic model for neonatal blood volume transition.

Both early and delayed clamping in newborn babies has their advantages and disadvantages, but which one is the best practice remains unclear [16] [17]. Delayed clamping is lead to increased risk of neonatal jaundice in a newborn baby, but their circulatory iron deposits (ferritin) remain high within six months [16]. Furthermore, it benefits those infants with poor access to nutrition, and decreased the risk of anaemia [3] [11]. Correspondingly, [2] [11] further stated that 2-3 minutes delay in clamping umbilical cord does not increase the risk of postpartum haemorrhage among women. By the

same token, the average birth weight of their newborn babies tends to be higher than that of infants with early umbilical cord clamping. Moreover, [7] submitted that delayed umbilical cord clamping is linking to decrease the risk of necrotizing enterocolitis in newborn, decrease rates of deaths in mothers and neonates as well as decrease need for additional blood. In contrast, [5] held a different opinion regarding increased blood volume, in his submission, delayed cord clamping leads to polycythaemia Vera, a situation where all blood volumes increased making them viscous which in turn decrease the oxygen-carrying capacity of blood. Additionally, early cord clamping is found to reduce the risk of bleeding after birth in newborn babies, and very few of them required phototherapy for jaundice, they show low haemoglobin levels within 24-48 hours of birth, [16] [17]. Despite this evidence, there was no universal guide supporting an accurate timing for clamping and cutting of umbilical cord [11].

We have practice midwifery for a short period, but we always have confusion regarding the time to clamp and cut the umbilical cord as different authors came with different evidence to support their views. Infact, one of us once received a query for not clamping the cord immediately after birth in his place of work. Though he responded to the question with literary evidence, it was not accepted; they maintained that he have to operate with their institutional policy of which he disagree with due to lack of written operational policies. Which translated in to real terms 'practice without update' and for that, the chief nursing officer-in-charge of the hospital transferred him to the male medical ward where he can meet his male counterparts. That left us in a state of confusion on what is the best practice of timing, clamping, and cutting of umbilical cord after birth, and this challenging situation motivated us to search for more evidence.

## 2. Methods of Literature Search

We used systematic literature search using identified inclusion criteria of full-text primary studies or systematic reviews that focus on timing, clamping and cutting of umbilical cord, published between the years 2009 to 2016, and articles must be in English language in a peer reviewed academic journal. The search of literature was conducted using MEDLINE, CINAHL Plus with full text and British Nursing Index. Google Scholar was also used to access other available evidences. Utilizing the phrase 'Delayed AND cord clamping, OR early AND cord clamping' in MEDLINE. British Nursing index and CINAHL Plus with full text generates 497 results. Applying the limiters, only 68 meet the inclusion criteria, the same phrase generated 33,900 results in Google scholar but reduced to 17,100 when filtered with identified limiters. Utilizing a two-step screening process as recommended by the Centre for review and dissemination [6], which is screening the titles/abstract of the papers against the inclusion and full text screening, a total of 11 papers were selected. These include 3 were systematic reviews, 3 primary

research papers, 2 literature reviews and lastly 3 conference /opinion papers. The selected papers were quality appraised using the CASP tool.

#### 3. Discussion of Selected Literatures

Growing number of evidence support delayed umbilical cord timing but the majority of practitioners practices early timing [21] [29]. In like manner, [11] discovered that 56.2% of babies delivered in a tertiary care center in Canada had their umbilical cord clamped within 15seconds which is early timing. This outcome conforms to the recommendations of early cord clamping by the United Kingdom National Collaborating Centre for Women's and Children's health [31] [32]. Identically, the submission of [16] [17] shows that most umbilical cord clamping is done within one minute of delivery and should form part of measures to prevent postpartum bleeding in women during the last phase of labour. Moreover, it was discovered that after giving birth, there is no significant difference in both preterm and fullterm babies whose umbilical cord was clamped early concerning postpartum bleeding [33] [24] [25] [26] [29]. Above all, postpartum haemorrhage accounts for 1/4 of maternal deaths globally [11] [26] [2] [4]. Some of the associated problems with early cord clamping are respiratory difficulties and anaemia within 24 hours. Also, there is the deprivation of some blood volume of about 30% as 1/3 of blood needed for foetoplacental exchange is between the placenta and the cord [16] [29] [17] [5] [9].

There exists a variation among practitioners regarding cord clamping as evidenced by the findings [11] shows that midwives tend to delay clamping umbilical cord by 120 seconds. This outcome is similar to the report of the survey conducted in the United Kingdom whose outcome shows that midwives resort to late cord clamping than any other practitioner in obstetric practices [34]. On the contrary, 66.7% of obstetricians clamp and cut the cord immediately after birth (0-15seconds), this is possibly so because most of them had an assistant who clamps the umbilical cord for them [11]. As has been noted, we can deduce from this study that using birth assistant is a factor associated with immediate cord clamping [11]. Besides, there is increased the risk of anaemia at four months of age. The most compelling evidence is the findings of randomized control trial by [3] which shows about 6% of the participants on early cord clamping had anaemia with projected neurological challenges as against late with only1%.

Late umbilical cord clamping, it is said to be the most beneficial approach to newborn babies [20] [3] [21] [29]. However, most practitioners are reluctant to implement it. Must be remembered, is the findings of [20] that discovered 50% of practitioners do not practice late clamping due to lack of knowledge, 37.2% do not practice it thoroughly while 53.4% practices occasionally. A study conducted by [3] and [29] shows that late cord clamping improves iron level in blood by 40% with a decreased risk of anaemia in the first 48 hours of life and at 4 or 6 months of age. Correspondingly, the result is similar to the outcome of the systematic review by [16] that shows increased level of iron at six months for infants with delayed cord clamping. Consequently, it is the most recommended practice in low and middle-income countries due to lack of iron and high incidence of anaemia [21] [29] [5]. It further reduces respiratory challenges and treatment for jaundice [20] [3]. As can be expected, at a risk ratio of 0.61, confidence limit of 95% (0.46-081), late umbilical cord clamping is found to decreases the need for blood transfusion [21]. Furthermore, there is 39% reduction in plasma need as about 80mls of blood and immunoglobulin's are transferred to the baby within one minute or 100mls after 3 minutes of birth from the placenta [26] [2] [29]. To put another way, delayed cord clamping reduces the incidence of bleeding within the ventricles of the newborn by 50% as identified by seven out of the ten trials consulted by [2]. In a similar study conducted by [21] delayed cord clamping is associated with less bleeding within ventricles with a risk ratio of 0.59, at 95% confidence limit (0.45-0.85). By the same token, delayed clamping may lead to excessive vertical blood exchange leading to increasing the number of all blood cells specifically in newborn with restricted growth within the uterus and those with diabetic mothers. Furthermore, some of the problems associated with late cord clamping include a decrease in body temperature due to prolong exposure to the environment [11], an increase in all blood volumes [20]. What is more, is the potential for having jaundice due to high blood bilirubin content with a differential mean of 15.01millimol per liter at 95% confidence limit (5.62-24.40) [21], and timing for resuscitating the newborn baby tends to be restricted. Moreover, delayed cord clamping in term infants may contribute to respiratory complications [21].

Equally important, [26] are of the view that effort to revive preterm infant can be affected by the late umbilical cord clamping, leaving the practitioner in a dilemma on what to do to help the baby that is in need of additional blood for physiological stability. However, immediate clamping is a necessity in some situation of respiratory difficulties [29].

As noted above, [29] submitted that neonates with respiratory challenges should have their umbilical cord clamped within one minute of delivery which is suggestive of early timing. The possibility is to allow for resuscitation of those born prematurely with poorly developing pulmonary function, low circulatory blood volume, and bowel disease which affect external adaptation [21] [5]. However, [21] are of the opinion that before clamping the cord within one minute, milking should be done to squeeze cord blood towards the baby. Furthermore, [35] concluded that the cord contains about 20 mls of blood within it which may be a loss with immediate clamping without milking, and that would help facilitate extrauterine adaptation of the newborn.

Finally, there exists no significance variation between late and immediate cord clamping concerning cord blood PH, Apgar scoring, increased number of blood cells and respiratory challenges [16] [2] [26].

# 4. Conclusion

Based on the outcome of this study, early cord clamping is shown to be effective in preventing postpartum bleeding among mothers. However, it comes with some problems notably respiratory challenges, anaemia within 24 hours with increased risk at four months of age of the infant. On the other hand, late cord clamping improves blood ferritin level, decreases the risk of anaemia in the first 48hours of life and at 4 and six months of age. Additionally, it reduces respiratory challenges and the needs for treatment of jaundice. Despite the above-stated benefits, it is associated with some problems like hypothermia, a potential for jaundice and polycythaemia Vera in newborn with restricted growth within the uterus and those with diabetic mothers. It is therefore concluded that delayed umbilical clamping is the most evidenced-based practice and most beneficial practice to newborn babies and their mothers.

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