Mansoura Nursing Journal (MNJ) Vol. 10. No. 2 – 2023 **Original Article**
Print ISSN: 2735 – 4121 Online ISSN : 2735 – 413X

Maternity Nurses' Knowledge regarding Umbilical Cord Blood Collection

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1.ABSTRACT

Background: A stem cell is a master cell that has the ability to multiply and produce cell types, which continue to differentiate and renew itself and can regenerate tissue with functional damage. This study **aimed to** assess the maternity nurses' knowledge regarding cord blood collection. **Study design:** across sectional research design was utilized. **Setting**: This study was conducted in labor and delivery unit of four governmental hospitals at Mansoura City Dakahlia Governorate, Egypt. **Study sample**: A convenient sample included 53 nurses. **Tool**: Data were collected through a structured interviewing questionnaire, included two parts: Part 1 sociodemographic characteristics of nurses and Part II included nurses' knowledge about cord blood collection and stem cells. **Results:** : It was observed that 33.7% of nurse's gained information from book, magazines and brochures, 41.5 % of the studied nurses had poor level of knowledge regarding the umbilical cord, cord blood collection, technique of cord blood collection and stem cells 58.5% of the studied nurses had negative attitude toward cord blood collection and stem cells **Conclusion**: Based on findings of the present study, it concluded that most studied nurses had poor level of knowledge regarding the umbilical cord, blood collection, technique of cord blood collection and stem cells. **Recommendations**. In-service training programs related to cord blood collection and stem cells must established to improve nurses' knowledge. Simple booklets regarding cord blood collection and stem cells should be available and easily access in labour units.

Keywords *: Blood collection, Knowledge, Stem cells, Umbilical cord*

2.Introduction:

The umbilical cord is considered both the physical and emotional attachment between mother and fetus. This structure allows for the transfer of oxygen and nutrients from the maternal circulation into fetal circulation while simultaneously removing waste products from fetal circulation to be eliminated maternally **(Basta & Lipsett, 2020).** On the other hand, mothers associate an emotional connection to the fetus through the cord. It may merit consideration as the route of love and care during pregnancy. Thus, some poets call it the string of life **(Hariati etal., 2021).**

The umbilical arteries carry deoxygenated blood from fetal circulation to the placenta. The two umbilical arteries converge together about at 5 mm from the insertion of the cord, forming a type of vascular connection called the Hyrtl's anastomosis **(Sled etal.,2019).** The primary function of Hartl's anastomosis is to equalize blood flow and pressure between the umbilical and placental arteries. As the arteries enter the placenta, each bifurcates into smaller branches called the chorionic vessels **(Prabavathy, Sadeesh, Meera & Anbalagan, 2020).**

Umbilical cord blood banking is the process of collecting and storing cord blood left in newborn's umbilical cord and placenta in the immediate period after the birth of a baby for future medical use. Cord blood contains potentially lifesaving cells called stem cells **(Bazinet & Popradi, 2019).** Umbilical cord blood, the 100 or so milliliters of blood retained in the placenta and cord after birth, is an accessible source of hematopoietic stem cells. It has become therapeutically valuable tissue over the last fifteen years because it can act as a substitute for bone marrow transplant in the treatment of blood disorders. Since the 1970s, bone marrow transplant has been used to rebuild the patient's blood system as part of the treatment for leukemia, immune deficiency, aplasia and genetic metabolic disorders **(Savage & Dufour, 2017; Belderbos et al., 2020).**

Umbilical cord blood collection is primarily carried out by obstetricians, midwives and nurses or other duly qualified university level technician during the third stage of a vaginal labour or cesarean delivery. The goal of the procedure is to collect hematopoietic stem cells (HSCs) for government umbilical cord and placental blood banks (UCPBBs), for subsequent used for transplantation and for the treatment of a number of malignant and non-malignant diseases **(Ren, Xu et al., 2021).**

Umbilical cord blood is collected from both the umbilical artery (thinner vessels) and vein (larger vessel). Either before the placenta is delivered (in utero) or following placental delivery (ex utero). Both methods have advantages and disadvantages. Both techniques are used at Canadian public cord blood banks, although the

in utero technique is preferred by most public banks in the United States and many European countries because it can be performed in the delivery room by birth unit staff, is easy to learn, and does not usually require additional personnel or resources **(Hare, Deleon. et al., 2021).**

Most Egyptian maternity nurses have inadequate knowledge of cord blood banking **(Mohammed and El Sayed., 2015)**. They were founded that most nurses had poor knowledge of cord blood, collection and uses. Obstetricians and others health care professionals delivering antenatal care should take it as a primary responsibility to increase awareness of umbilical cord blood donation to develop and expand public banking activities. In recent a study of awareness and acceptance of UCB in the United States revealed that 80% of the obstetricians felt confident discussing UCB options with their patients; however, 49% indicated that they have insufficient knowledge of cord blood donation to answer effectively patients' questions about donation **(Ghiasi, 2021)**.

Further research is required to identify and investigate health care professional's concerns regarding the practice of cord blood collection, the sources and influences associated with health professionals' negative views about cord blood banking, timing of cord clamping and safety of mother and infant. Understanding these factors may assist in addressing health professional knowledge and attitude deficits, which in turn impact their ability to provide parents with evidence-based, unbiased information to support autonomous parental decision making in this important area **(Ahmed, Mohammed, AbdEl-hady & Abd El Aliem, 2022).**

Nurses can also play a great role in counselling patients who wish to receive more information about cord blood banking and how to undergo the process, especially if they are admitted to a birthing facility where their gynecologists or obstetrician may not be present to oversee the cord blood collection. More significantly, they can help save precious time right after the birth by conducting the cord blood collection process by themselves in the absence of a doctor **(Lucatorto, Thomas & Siek, 2016).**

2.1 Significance of the study

In spite of benefits of stem cells gained from umbilical cord blood, the umbilical cord was considered medical waste and disposed after delivery along with the placenta due to the lack of knowledge about its benefits and uses **(Cooper &Severson, 2013).** Maternity nurses' knowledge regarding cord blood collection and stem cells were studied in many countries, however, there is a lack of Egyptian studies in this field. Hence, the present study will be conducted to assess maternity nurses' knowledge regarding umbilical cord collection.

2.2 Aim of the study:

This study aimed to assess maternity nurses' knowledge regarding umbilical cord blood collection

2.3 Research question:

What are the maternity nurses' knowledge regarding cord blood collection?

3. Study and Method

3.1 Study Design

A descriptive cross section study design was used to achieve the current research's goal. It's an observational research in which a defined population's condition and potentially connected factors are monitored at a specific point in time to assess maternity nurses' knowledge and attitude regarding umbilical cord blood collection.

3.2 Study Setting

This study was conducted at the obstetrics and gynecology wards of Mansoura University Hospitals, El-Mansoura city, Dakahlia governorate, Egypt. It is affiliated to the Ministry of Higher Education. The Hospital included four internal wards of obstetrics and gynecology named nine, ten, fifteen and eighteen. They are located at the 3rd and 4th floor in the hospital. Every ward contains from 26 to 30 beds and receives high risk pregnancy and postnatal conditions. Also, every ward has a day for outpatient and another day for emergency situations.

Mansoura Old General hospital consist of three floors and anther floor beside blinding for ward of obstetrics and gynecology. It consists delivery room and rooms for post labor. Mansoura Old General hospital has 9 nurses.

Mansoura New General Hospital consists of seven floors. The fourth floor contained many section, one of them contained room for gynecological disease patient, antenatal room high risk women, delivery room and post labor. the unit provider's other services such as prenatal, postnatal follow up, ovulation follow up through ultrasound and family planning services.

Sandoub Health Insurance Hospital consists of six floors. The second floor contained many section, one of them contained room for gynecological disease patient, antenatal room high risk women, delivery room and post labor. the unit provider's other services such as prenatal, postnatal follow up, ovulation follow up through ultrasound.

3.3 Sample type

A Convenience a sample was used.

3.4 Study Subjects

This study was conducted on 53 nurses who were working at labour and delivery unit in previously mentioned hospitals. 25 nurses from Mansoura University Hospital, 9 nurses from Mansoura Old General Hospital, 10 nurses from Mansoura New General Hospital, and 9 nurses from Sandoub Health Insurance Hospital.

3.5 Sample Size

All maternity nurses working in labour and delivery unit at the time of the data collection. The sample of nurses was calculated based on data from literature **(Mohammed and El Sayed, 2015)**.

3.6 Study Tool

To achieve the aim of this study, one tool was used for data collection.

A Structured Interview questionnaire:

It was developed and used by the researcher it is consisted of two parts:

Part 1: It included sociodemographic data such as age, educational level, residence, years of working experience, attendance of training courses regarding cord blood collection and the source of knowledge.

Part II: It included nurses' knowledge about cord blood collection and stem cells. It consisted of 5 sections;

- **Section (1)** general knowledge regarding umbilical cord; it consisted of 5 items anatomy, physiology, functions, abnormalities, and proper time of clamping umbilical cord.
- **Section (2)** knowledge regarding cord blood collection, it consisted of 9 items (definition, benefits, indications, contraindications, appropriate time of collecting cord blood, places for cord blood storage, length of time for cord blood storage, barriers of collecting of cord blood, and responsible persons for collecting cord blood).
- **Section (3)** knowledge regarding technique of cord blood collection, it consisted of 5 items (methods, preparation, components of collection set, precautions of infection control, and technique of cord blood collection).
- **Section (4)** knowledge regarding stem cells, it consisted of 5 items (definition, sites, importance of stem cell from umbilical cord blood, uses, and ethical considerations of obtaining stem cells from umbilical cord).
- **Section (5)** it consisted of 7 items, it was included nurses' knowledge regarding the recommended procedures during cord banking and the precautions during the collection of blood, such as the collection of blood in a special bag that containing anticoagulant agents, the importance of processing and freezing the collected blood immediately, the recommended temperature for storing and following the infection control precautions it also contained data related to the importance of blood banks accreditation and the cord blood standards which must be followed.

Scoring system for knowledge: Each item in the knowledge tool is scored as zero for incorrect answer or 1 for the correct answer. The total score is obtained by summing up the answers for the 24 items that form the knowledge tool, yielding a total score that ranges from 0 to 24. The total score is categorized as either poor (<50% of the total score), fair (50 – 65% of the total score) and good (>65% of the total score). **(Esmail, Abood, Saed, & AbdElmordy, 2022; Ibrahim, Fahmy, Hameed, & Fathy, . 2022).**

3.7 Validity of the study tools

The tool used in the study was checked for its content validity by a jury of professor of 3 experts in the field of woman health and midwifery nursing. Recommended modification and reconstruction of the tools were done such as the long question was change to the short question.

3.8 Reliability of the study tool

Reliability was done by using Chronbach Alfa Coefficient for the study tool, its values (0.67).

3.9 Pilot study

A pilot study was carried out on 10% of the total study sample (6 nurses) to evaluate the clarity and applicability of the study tool as well as to estimate the time needed for answer. The results of pilot study were not included in the sample size, according to the analysis of the pilot result, modification of the tool were done as paraphrasing of some sentences.

3.10 Ethical Considerations

- Ethical approval was obtained from the Research Ethics Committee at the Faculty of Nursing, Mansoura University.
- Official permission to conduct the study was obtained from the responsible directors of the hospitals.
- Written consent was obtained from nurses involved in the study sample after explaining the purpose and the nature of the study.
- The participants were reassured about the privacy, safety, and confidentiality of the collected information throughout the study.
- The participants were informed about their right to refuse participation or withdraw from the study at any time.
- All data were stored securely in the researcher's computer files and used only for the purpose of addressing the research question and would also be burned on the completion of the study.

3.11 Research process

The research process was carried out through two phases; preparatory and operating phase. Preparatory phase included; reviewing literature, developing the study tool and pilot study, while the operating phase included; data collection and data analysis**.**

Preparatory phase:

The tool was prepared by the researcher after reviewing the local and international relevant literature in order to collect all necessary information related to the research.

Operating phase:

Data collection

- This study was carried out in the period from the beginning of September 2017 to the end of March 2018, to collect the data needed after obtaining the official permission from the directors of the hospitals to carry out the study.

- The researcher introduced herself to nurses and explained the aim of the study and obtained their written consent to participate after assuring the confidentiality of data.
- The researcher was attended to Mansoura University Hospital, Mansoura old General Hospital, Mansoura New General Hospital and Sandoub Health Insurance Hospital according to the hot days of the studied hospitals three days per week from 9 a.m to 2 p.m until the calculated sample were obtained. Data were gathered by the researcher through a structured interview questionnaire that measured the maternity nurses' general characteristics, the nurses' knowledge about cord blood collection and stem cell.

3.12 Statistical Analysis:

The information was sorted, structured, coded, and transferred into specially created formats for computer entry. SPSS version 22 was used for the statistical analysis. Frequencies and percentages were used to describe quantitative data. All continuous data were normally distributed and were expressed in Mean ± Standard deviation (SD). Categorical data were expressed in number and percentage. When comparing variables with categorical data, the Chi-square test was utilized. The internal consistency of the tools used in the study was tested using Cronbach's alpha. The criteria for statistical significance were established at $p<0.05$.

4. Results

Table 1: shows that (39.6%) of the studied nurses were in the age ranged from 25 to less than 30 years old, (56.6%) of them were from the rural areas and (45.3%) of them had bachelor's degrees. (30.2%) of the studied nurses were working at Mansoura University Hospital, (26.4%) at Mansoura International Hospital, (22.6%) at Mansoura General Hospital, and (20.8%) at Sandoub Health Insurance Hospital. Regarding years of experience of studied nurses (37.7%) had 5 >10 years of experience, (49.1%) of them had to work from 50<100 hours per week, and (83.0%) of them not attended training courses about cord blood collection and stem cells.

Table 2: shows that (75.5% and 71.71%) of the studied nurses had correct knowledge about definition and appropriate time of collecting cord blood respectively. More than half of them (56.6%,50.9%,54.7%, respectively) had correct knowledge about contraindications of cord blood collection, places, and the length of time for cord blood storage. In addition, 66.4% and 60.4% respectively had correct knowledge regarding the barriers and responsible persons for collecting cord blood. On the other hand, (56.6% ,60.4%,43.4%,49.1%45.3% respectively) had incorrect knowledge regarding benefits and indications, contra indications of cord blood collection, places and length of time for cord blood storage.

Table 3: illustrates that (56.6% and 50.9 % respectively) of the studied nurses had correct knowledge regarding the preparations of umbilical cord blood collection and components of blood collection set. On the other hand, (58.5%,69.8% and 50.9% respectively) had incorrect knowledge regarding precautions of infection control, methods and the steps of cord blood collection.

Table 4: shows that (60.4%, 54.7 %, 69.8 %, and 56.6 % respectively) of the studied nurses had incorrect knowledge regarding the definition, importance, uses and ethical considerations of obtaining stem cells from the umbilical cord.

Figure (1): highlighted that (33.7%) of studied nurse's gained information from book, magazines and brochures. While, (32.1%) of them gained information from websites and (30.2%) from study.

Figure (2): shows that (34.0%) of the studied nurses had poor knowledge regarding umbilical cord, (37.7%) of them had fair knowledge and (28.3%) of them had good knowledge.

Figure (3): highlighted that (41.5 %) of the studied nurses had poor level of knowledge, (37.7%) had fair level of knowledge, and only the minority of them (20.8%) had good level of knowledge regarding the umbilical cord, cord blood collection, technique of cord blood collection and stem cells, respectively.

5.Discussion

This study aimed to assess the maternity nurses' knowledge regarding cord blood collection. The findings of this study was discussed in the frame of reference of the following research question: what are the maternity nurses' knowledge regarding cord blood collection.

Concerning the attendance of training courses about cord blood collection and stem cells, the current study revealed that almost the studied nurses not attended training courses about cord blood collection and stem cells. Similarly, Egyptian study by **Ibrahim et al., (2022)** aimed to assessment of knowledge and attitude of maternity nurses regarding cord blood collection and found the majority of nurses not attended training courses about cord blood collection and stem cells. This is may be due to the nurses were not informed that the training was for their benefits also there is no policies which strict on the attendance on the training day.

Concerning the source of nurse's knowledge regarding the cord blood collection, the present study discovered that more than one third of nurse's gained information from book, magazines and brochures and more than one third of them gained information from websites. On the other hand, Egyptian study by **El-Sayed, Elmashad & Aboud (2018)** aimed to applying counseling regarding umbilical cord stem cells collection and banking among pregnant women: its effect on their knowledge and attitude and found almost gained information from media/internet (social media) and the least gained information from friends. However, Malaysian study by **Subramaniam, Mangantig, Mazlan & Fauzi (2022)** aimed to describe the knowledge and attitude of pregnant women towards cord blood banking and found the almost gained information from Healthcare provider. The differences in sources of knowledge in the previously mentioned studies may be due to change in the educational and cultural level between studied subjects.

As regard to studied nurses' knowledge regarding umbilical cord, the present study findings revealed that more than half of studied nurses had correct knowledge regarding the anatomy, abnormalities, physiology, the function of the umbilical cord and the proper time of clamping the umbilical cord. These findings were in agreement with studies done by **Ibrahim et al. (2022)** they found the most nurses had good level of knowledge regarding umbilical cord. This is may be justified as assessing the cord is considered a part of routine of immediate care of newborn in all labor units.

Regarding nurse's knowledge about umbilical cord blood collection, the existing study findings showed that most studied nurses had correct knowledge about definition and appropriate time of collecting cord blood and had correct answered about contraindications of cord blood collection, places for cord blood storage, barriers and responsible persons for collecting cord blood. Likewise, study done by **Subramaniam et al. (2022)** they found with the average correct answer rate, less than one fourth of participants were able to obtain a score above partial of the total scores, and only the least of the participants had fundamental knowledge.

Regarding the nurse's knowledge about the technique of cord blood collection, the current study findings revealed that more than half of the studied nurses had correct knowledge regarding the preparations of umbilical cord blood collection and components of blood collection set. Congruently, Indian study by **Bala, Chaudhary & Kaur (2021)** they investigate the effectiveness of structured teaching program on knowledge regarding umbilical cord blood banking among nursing students, and found near the three quarter of the participants having average knowledge score.

Concerning distribution of the studied nurses according to their knowledge regarding stem cells. The current results showed that more than half and also two thirds of the studied nurses had incorrect knowledge regarding the definition, the importance, uses and ethical considerations of obtaining stem cells from the umbilical cord which may be attributed to most of studied nurses had diploma degree in nursing also, un attending training courses or clinical workshops to raise their knowledge level.

The current study finding were in agreement with Egyptian study by **Shaban, et al. (2019)** and Indian study by **Saraswat & Singh (2021)** aimed to explore the effectiveness of structure teaching programme on knowledge regarding umbilical cord stem cell therapy among staff nurses. The Egyptian and Indian studies showed that the most of studied nurses had incorrect knowledge regarding stem cells.

In addition, supporting the current study result, Saudi study by **Tork, et al. (2017)** aimed to assess the knowledge among health care providers regarding the stem cells. They also found poor knowledge score regarding the stem cells among nurses. On the other hand, the current study findings were contradicted with Indian study by **Venugopal, Joshi, Deka & Seth (2016)** aimed to assess the knowledge of nurses regarding stem cells and umbilical cord blood banking. They found less than the half of nurses had good knowledge regarding stem cells.

When shedding light on the maternity nurses' knowledge regarding umbilical cord blood collection and stem cells, the current study findings showed that the studied nurses had poor knowledge and this reflects the extent to which they need awareness because the nursing is a significant healthcare provider which will be extremely useful in communicating accurate information about stem cells to women and the general public.

6. Conclusion

Based on the current study results it can be concluded that less than half of the studied nurses had poor level of knowledge, more than one-third of them had fair knowledge, and the minority of them had good knowledge regarding the umbilical cord, cord blood collection, technique of cord blood collection and stem cells. Less than half of the studied nurses had positive attitude toward cord blood collection and stem cells.

7. Recommendations

Based on the finding of this study, the following recommendations are suggested:

- In-service training programs related to cord blood collection and stem cells must established to improve nurses' knowledge.
- Simple booklets regarding cord blood collection and stem cells should be available and easily access in labour units.
- The nursing curriculum should include the current technologies to update the knowledge regarding recent advances as stem cells.
- Replication of the study on a larger probability sample from various sites in Egypt to provide strong evidence about the effectiveness of the maternity nurses' knowledge regarding umbilical cord blood collection.
- Further research should focus on understanding the attitude and opinions of nurses and how their practices may be influenced by cord blood collection.

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Table (1): Number and distribution of the studied nurses according to their general characteristics

Items	N (53)	%
Age (years)		
<25	19	35.8
25 – 30	21	39.6
>30	13	24.5
Mean ±SD	27.2 ±5.4	
Residence		
Rural	30	56.6
Urban	23	43.4
Level of Education		
Diploma	11	20.8
Bachelor	24	45.3
Master	18	34.0
Workplace		
Mansoura University Hospital	16	30.2
Mansoura General Hospital	12	22.6
Mansoura International Hospital	14	26.4
Sandoub Health Insurance Hospital	11	20.8
Years of experience in labour unit		
<5	17	32.1
5 – 10	20	37.7
>10	16	30.2
Workload in labour unit per week (Hours/week)		
<50	17	32.1
50 – 100	26	49.1
>100	10	18.9
Attendance of training courses about cord blood collection and stem cells		
No	44	83.0
Yes	9	17.0

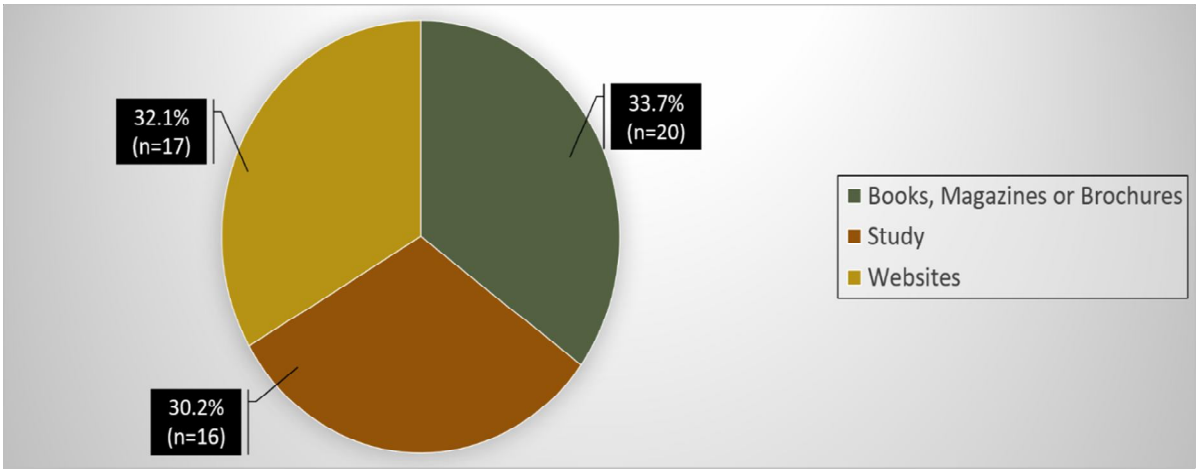

Figure 1. Source of nurses' knowledge regarding the cord blood collection

Table (2):Number and distribution of the studied nurses according to their knowledge regarding umbilical cord blood collection (n=53)

Items	Incorrect		Correct	
	N	%	N	%
- Definition of cord blood collection	13	24.5	40	75.5
- Benefits of cord blood collection	30	56.6	23	43.4
- Indications of cord blood collection	32	60.4	21	39.6
- Contraindications of cord blood collection	23	43.4	30	56.6
- Appropriate time of collecting cord blood	15	28.3	38	71.7
- Places for cord blood storage	26	49.1	27	50.9
- Length of time for cord blood storage	24	45.3	29	54.7
- Barriers of collection of cord blood	18	34.0	35	66.0
- Responsible persons for collecting cord blood	21	39.6	32	60.4

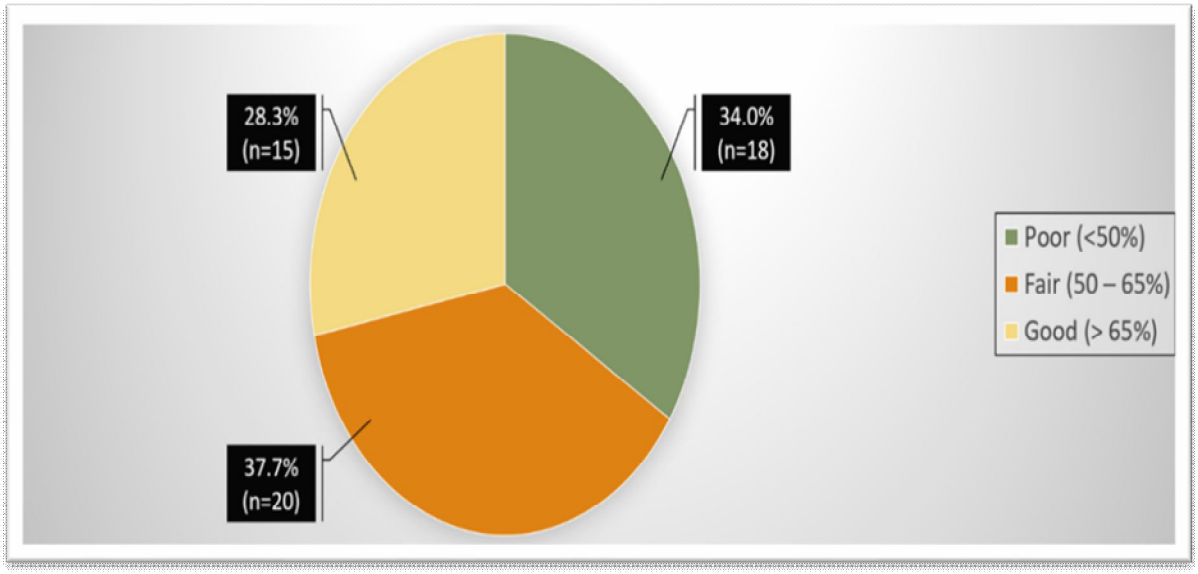

Figure 2. Total knowledge level of the studied nurses regarding umbilical cord(n=53)

Table (3) :Number and distribution of the studied nurses according to their knowledge regarding technique of cord blood collection(n=53)

Items	Incorrect		Correct	
	N	%	N	%
- Preparations of umbilical cord blood collection	23	43.4	30	56.6
- Precautions of infection control	31	58.5	22	41.5
- Components of blood collection set	26	49.1	27	50.9
- Methods of umbilical cord blood collection	37	69.8	16	30.2
- Steps of cord blood collection	27	50.9	26	49.1

Table (4): Distribution of the studied nurses according to their knowledge regarding stem cells (n=53)

Items	Incorrect		Correct	
	N	%	N	%
- Definition of stem cells	32	60.4	21	39.6
- Sites of obtaining stem cells	26	49.1	27	50.9
- Importance of obtaining stem cells from umbilical cord	29	54.7	24	45.3
- Uses of stem cells	37	69.8	16	30.2
- Ethical considerations of obtaining stem cells from umbilical cord	30	56.6	23	43.4

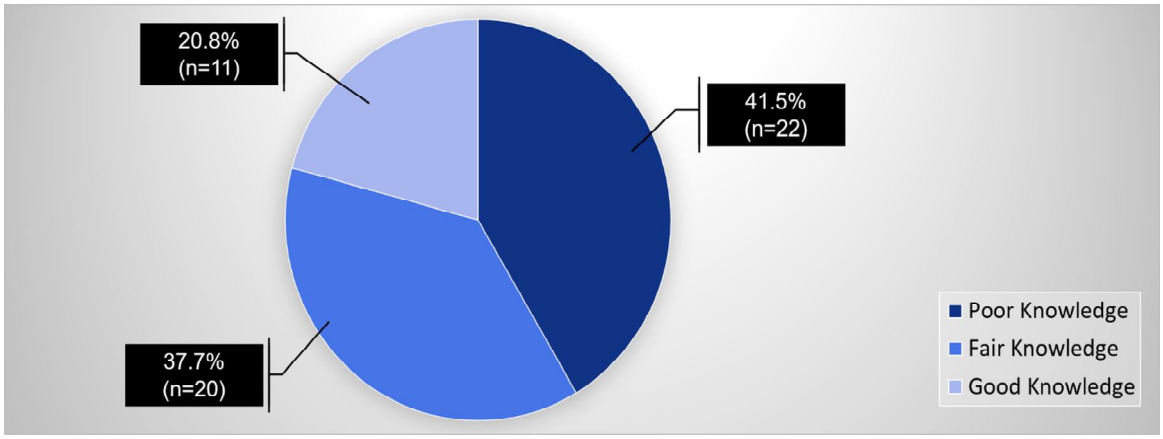

Figure 3. Distribution of the total knowledge level regarding the umbilical cord, cord blood collection, technique of cord blood collection and stem cells