



Sudan University of Science and Technology

College of Graduate Studies

College of Medical Laboratory Science

**Assessment of Quality Parameters of Platelets Concentrated Prepared at
ElmekNimer University Hospital Blood Bank-ShendiCity**

تقويم عوامل الجودة للصفائح الدموية المركزة المحضرة في بنك الدم لمستشفى المك نمر الجامعي-مدينة شندي

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﴿ بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ ﴾

اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ ﴿١﴾ خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ ﴿٢﴾ اقْرَأْ وَرَبُّكَ الْأَكْرَمُ ﴿٣﴾ الَّذِي عَلَّمَ بِالْقَلَمِ
﴿٤﴾ عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ ﴿٥﴾

صدق الله العظيم

سورة العلق الآية (٥-١)

Dedication

To my mother

To my father

To my brothers

To my sisters

To my friends

And to my colleagues

I dedicate this work with my best wishes to all.

Acknowledgement

All my thanks are in the name of Allah, the most Gracious and the most Merciful.

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Abstract

This study is a descriptive and analytical prospective cross-sectional study conducted in the period from February to April 2015 to assess the quality parameters of platelet concentrates prepared at Elmek Nimer University Hospital Blood Bank. Fifty Platelet concentrate units were prepared from whole blood using the platelet-rich plasma method. All units were stored at 22 ± 2 °C on a flatbed agitator for five days. Platelet quality parameters including the platelet count, volume of the platelet concentrate, swirling, residual white blood cells, red blood cells and pH were assessed on day one and day five.

The results revealed that the mean platelet concentrate volume was 72.06 ± 10.42 ml and ranged from 50-93 ml Vs a mean of 68.06 ± 10.42 ml and range from 46-89 ml, the mean platelet count was $5.09\pm 1.5\ \times 10^{10}$ /Unit and ranged from $2.2\text{-}9.9\ \times 10^{10}$ /Unit Vs a mean of $4.50\pm 1.46\ \times 10^{10}$ /Unit and range from $1.9\text{-}9.2\ \times 10^{10}$ /Unit, the mean residual white blood cells was $18.96\pm 16.69\ \times 10^6$ /Unit and ranged from $0.0\text{-}83.6\ \times 10^6$ /Unit Vs a mean of $13.32\pm 13.12\ \times 10^6$ and the range from $0.0\text{-}57.6\ \times 10^6$ /Unit, the contaminated red blood cells had a mean of $1.41\pm 0.78\ \times 10^9$ /Unit and ranged from $0.0\text{-}3.20\ \times 10^9$ /Unit Vs a mean of $1.33\pm 0.74\ \times 10^9$ /Unit and range from $0.0\text{-}3.04\ \times 10^9$ /Unit, swirling score had a mean of 2.94 ± 0.24 score and ranged from 2-3 score Vs a mean of 1.92 ± 0.63 score and range from 1-3 score and the mean pH was 7.94 ± 0.20 and range from 7.4-8.2 Vs a mean of 7.72 ± 0.23 and range from 7.3-8.1 for day one and day five respectively. On day one 38 %, (19) of the platelet concentrate had a volume of 50-70 ml, only 4 %, (2) had a platelet count of $>5.5\ \times 10^{10}$ /Unit , 4% (2) of the platelet concentrates did not have detectable red cell contamination, score 3 swirling was observed in 94 % , (47) of units and only 6% , (3) revealed score 2 swirling. No unit had score 1 swirling and the pH was

above 6.2 in all units. On day five only 30%, (15) of the concentrates had a platelet count of $\geq 5.5 \times 10^{10}$ /Unit, 16%, (8) of units had score 3, and the pH was maintained above 6.2 in all units.

The study revealed that only less than half of the platelet concentrates units fulfilling minimum quality requirement specifications for platelet counts while all units had pH well above quality requirement specifications. Also there was significant decrease in the quality parameters at day five than day one (P value <0.05). This indicated that further standardization on the methods of platelet concentrate collections, preparation and storage is required.

الخلاصة

هذه الدراسة هي عبارة عن دراسة وصفية تحليلية أجريت في الفترة من فبراير الي أبريل ٢٠١٥ لتقييم وقياس عوامل الجودة للصفائح الدموية المركزة المحضرة في وحدة بنك الدم لمستشفى المك نمر الجامعي (مدينة شندي).

تم تحضير عدد ٥٠ وحدة من الصفائح الدموية المركزة وذلك عن طريق فصلها من الدم الكامل باستخدام طريقة البلازما الغنية بالصفائح الدموية. كل الوحدات تم حفظها في جهاز هزاز مسطح في درجة حرارة ٢٢-٢٤ درجة مئوية لمدة خمسة أيام ، وتم اختبار جودة الصفائح الدموية المركزة وذلك بقياس كل من عدد الصفائح الدموية ، بقايا خلايا الدم البيضاء ، خلايا الدم الحمراء ، الحجم ، درجة الحموضة والقلوية وملاحظة ظاهرة دوران والتفاف الصفائح الدموية في كل وحدة صفائح دموية وذلك في اليوم الاول والخامس من التحضير.

النتائج اظهرت ان متوسط حجم وحدة الصفائح الدموية كان 72.06 ± 10.42 مل وتراوح بين ٥٠-٩٣ مل مقابل متوسط 68.06 ± 10.42 مل ومدى بين ٤٦-٨٩ مل ، متوسط عدد الصفائح الدموية كان $10 \times 1.01 \pm 0.09$ وحدة وتراوح بين ٢.٢ - 9.9×10^9 / وحدة مقابل متوسط $1.0 \times 1.46 \pm 4.50$ وحدة / وحدة ومدى بين ١.٩ - 9.2×10^9 / وحدة، متوسط عدد بقايا خلايا الدم البيضاء كان $10^6 \times 16.69 \pm 18.96$ وحدة وتراوح بين ٠.٠ - 83.6×10^6 / وحدة مقابل متوسط $10^6 \times 13.12 \pm 13.32$ وحدة ومدى بين ٠.٠ - 57.6×10^6 / وحدة، متوسط عدد خلايا الدم الحمراء كان $10^9 \times 0.78 \pm 1.41$ وحدة وتراوح بين ٠.٠ - 3.20×10^9 / وحدة مقابل متوسط $1.33 \pm 0.74 \times 10^9$ وحدة ومدى بين ٠.٠ - 3.04×10^9 / وحدة ، متوسط التفاف ودوران الصفائح الدموية عند تعريضها لقليل من الضغط امام مصدر ضوئي كان 0.24 ± 2.94 وتراوح بين مدى ٢-٣ مقابل متوسط 0.63 ± 1.92 ومدى بين ١-٣ وأن متوسط درجة الحوضة والقلوية كان 0.20 ± 7.94 وتراوح بين $7.4 - 8.2$ مقابل متوسط 0.23 ± 7.72 ومدى بين $7.3 - 8.1$ في اليوم الأول واليوم الخامس على التوالي . في اليوم الاول (١٩) ٣٨% من الوحدات سجلت حجما بين ٥٠-٧٠ مل ، ٤٠% (٢٠) من الوحدات كان عدد الصفائح بها هو $5.0 < 10 \times 10^9$ / وحدة ، فقط ٤% (٢) من الوحدات هي التي لم يكن بها خلايا دم حمراء ، اما بالنسبة لالتفاف ودوران الصفائح الدموية فقد أظهرت ٩٤% (٤٧) من الوحدات معدل ٣ و ٦% (٣) اظهر معدل ٢ بينما لم يسجل اي من الوحدات معدل ١. كل الوحدات كانت درجة

الحموضة والقلوية فيها أعلى من ٦.٢. أما في اليوم الخامس فقط ٣٠ % (١٥) من الوحدات كان عدد الصفائح بها هو $\leq 5.0 \times 10^6$ / وحدة، ١٦% (٨) من الوحدات اظهرت معدل ٣ بالنسبة لظاهرة التفاف ودوران الصفائح الدموية بينما كل الوحدات كانت درجة الحموضة والقلوية فيها أعلى من ٦.٢ .

الدراسة اظهرت ان متطلبات مقاييس الجودة فيما يخص حجم وحدات الصفائح الدموية وعدد الصفائح الدموية مستوفاة فقط في اقل من نصف عدد وحدات الصفائح الدموية المركزة . اما درجة الحموضة والقلوية فهي مستوفية لمتطلبات الجودة في كل وحدات الصفائح الدموية المركزة. كما اظهرت الدراسة ان هناك نقصان واضح في عوامل جودة الصفائح الدموية في اليوم الخامس مقارنة باليوم الاول (القيمة الإحتمالية اقل من ٠.٠٥).وعليه فانهناك حوجة ماسة لمزيد من الضبط والمراجعة لطريقة جمع وتحضير وتخزين وحدات الصفائح الدموية المركزة لضمان جودتها وسلامتها.

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List of abbreviations

(PCs)	Platelet Concentrates
(5-HT)	5-hydroxytryptamine
(ADP)	Adenosine Diphosphate
(ATP)	Adenosine Triphosphate
(BCs)	Buffy Coats
(CMV)	Cytomegalovirus
(FDA)	Foods and Drugs Administration
(G)	Gravity
(GpIb)	Glycoproteins Ib
(GPIa)	Glycoprotein Ia
(HLA)	Human Leukocytes Antigens
(ITP)	Immune Thrombocytopenic Purpura
(PDGF)	Platelet-Derived Growth Factor
(PF4)	Platelet Factor- 4
(PRP)	Platelet-Rich Plasma
(RBCs)	Red blood Cells
(TXA ₂)	Thromboxane- A ₂
(VWF)	Von Willebrand factor
(WBCs)	White Blood Cells
DNA	Deoxy Ribonucleic Acid
pH	Potential Hydrogen
(CCI)	Corrected Count Increment
(BSA)	Body Surface Area
(DAT)	DirectAntiglobulinTest

(RhIG)	Rh ImmuneGlobulin
(Rh)	Rhesus System Antigeins
(RDPs)	Random-Donor Platelets
(PVC)	Polyvinyl Chloride
β -TG	Transforming Growth Factor Beta
(FNHTR)	Febrile Non-Hemolytic Transfusion Reaction
(GVHD)	Graft Versus Host Disease
(QC)	Quality Control
(Vs)	Versus

