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A Comparative Study of Erythrocyte Sedimentation Rate using Saline Diluted and Undiluted EDTA with TSC

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Abstract: ***Erythrocyte sedimentation rate (ESR) is the rate at which RBC sediment in a period of 1 hr. It is a common Haematology test that is a non-specific measure of inflammation and it became a common screening test worldwide for acute phase proteins and chronic diseases. The International Council for Standardization in Haematology (ICSH) recommended the Westergren method as the method of choice for ESR determination. TSC is almost exclusively used as the diluent of choice for setting up ESR, but some contemporary laboratories have resolved to use Normal saline (NS) as the diluent of choice while other set ESR using EDTA anticoagulated Blood (BLD) without any diluent. The objective of this study is to assess the comparison between saline diluted and undiluted EDTA with TSC as an anticoagulant in ESR detection and to find out any gender wise variations by using these anticoagulants. A total of 50 students were participated in this study. From each of the participants 5 ml of BLD was collected and it is then divided into 3 parts. 1.6 ml BLD to 0.4ml 3.8% TSC tube, 1.6 ml EDTA blood to 0.4 ml NS tube. 3rd tube with 2 ml EDTA BLD and set for ESR and obtained result within 1 hour. The Result is the mean ±SD value of ESR were 19.48±5.7 mm/hr. in undiluted EDTA, 15.22±4.6 mm/hr. in saline diluted EDTA & 15.36±4.5 mm/hr. in TSC. The mean difference of ESR value between saline diluted EDTA with TSC BLD was 0 and it with undiluted EDTA was 4 mm /hr. The study indicates that there was a significant difference between ESR value with undiluted EDTA and TSC while diluted EDTA and TSC were there is no significant difference. The mean ±SD of ESR value using undiluted, diluted EDTA and TSC in males were 16.20±3.3, 11.05±2.8, 11.29±2.6 and while it for females were 21.69±5.2, 17.36±3.8, 17.45±3.8 respectively. In conclusion, TSC is the best diluent to be used in contemporary lab to set ESR as compared to EDTA BLD. But we can use saline diluted EDTA as an alternative to citrate diluted BLD to set ESR and it also showed there is a gender wise variation in ESR using these anticoagulants.***

Keywords: ESR, BLD, TSC, EDTA, NS, SD

I. INTRODUCTION

Hematology is the branch of medicine involving study and treatment of BLD and BLD forming tissues [1]. BLD is a living tissue which consists of a straw-colored fluid medium called plasma in which RBC, WBC and PLTs are suspended [2,3]. The ESR, also known as sedimentation rate or Biernacki Reaction, is the rate at which RBC sediment in a period of 1 hr. This test was invented in 1897 by the Polish doctor Edmund Biernacki [2,4].

It is a common Hematology test that is a non-specific measure of inflammation and it became a common screening test worldwide for acute phase proteins and chronic diseases [5,6,7]. The principle of the ESR determination based on the measurement of the sedimentation rate of aggregated erythrocytes in plasma.

The International Council for Standardization in Hematology (ICSH) recommended the Westergren method as the method of choice for ESR determination.

When anticoagulated BLD is placed in Westergren tube in vertical column, the erythrocytes normally settle quite slowly by the influence of gravity and the distance of erythrocytes falling down in vertical column from plasma in within one hr. [8,9and 10]. TSC is almost exclusively used as the diluent of choice for setting up ESR, but some contemporary laboratory have resolved to use NS as the diluent of choice while other set ESR using EDTA anticoagulated BLD without any diluent. However, this study is geared towards analyzing the relationship between these diluents and anticoagulants in order to establish an acceptable method that may be cheaper but yield a reliable result. Therefore, our study designed to determine the relationship between using TSC, NS and EDTA whole BLD to set ESR.

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II. AIM AND OBJECTIVES

A. *Aim*

To assess the comparison between saline diluted and undiluted EDTA with TSC as an anticoagulant in ESR detection.

B. *Objectives*

1) To find out any relation between saline diluted EDTA and TSC.
2) To assess the relation between undiluted EDTA and TSC.
3) To find out any gender wise variation by using these anticoagulants.

III. MATERIALS AND METHODS

A total of 50 apparently healthy subject were recruited for this study. Among these 39 females and 21 males, with in the age range of 18-24 years. 5 ml of venous BLD was collected from each subject. 0.4 ml of 3.8% TSC and 0.4 ml of NS was pipetted into two different tubes. 1.6 ml of BLD was added to TSC tube. 1.6 ml of BLD was added to NS tube. 3rd tube is added with 2 ml of EDTA anticoagulated BLD. The mixtures were properly mixed and used to set ESR. After 1 hour, the results of sedimentation were read and recorded appropriately in mm per hr.

A. *Inclusion Criteria*

Students from both sexes and the age group of 18-24 years were included in this study.

B. *Exclusion Criteria*

BLD collected by venipuncture taking more than 30 seconds, with excessive venous stasis, BLD sample were not in proper proportions to the anticoagulant, strongly lipemic, hyperbilirubinemia and hemolyzed samples were excluded.
were exclude from this study.

C. *Methods of Blood Collection*

A written consent was obtained from the students who participated in this study. Study protocol was explained to the students, and also explains about the venous BLD collection methods. For the blood collection; Prepare the appropriate syringe and needle, Put the tourniquet on (not too tightly and do not leave it longer than 1 minute), Sterilize the area with 70% alcohol in a circular motion, then insert the needle at an angle of 10-20^0, After finishing filling the needed tubes, release the tourniquet and finely remove the needle from subject's body.

D. *Method for Processing of Samples*

5 ml of venous BLD was collected from each subject. 0.4 ml of TSC and 0.4 ml NS was pipetted into two different test tubes. 1.6 ml of BLD was added to TSC, 1.6 ml EDTA anticoagulated BLD to 0.4 ml NS tube. Then 2 ml EDTA BLD was added to 3rd tube. Mix anticoagulated BLD sample thoroughly. The Westergren tube is filled with BLD sample up to the 0 mark with the help of a rubber bulb. Then the tube was placed in a strictly vertical position in the ESR stand and left undisturbed for 1 hr. After exactly 1 hr. read the height of the column of plasma above the red cell column in mm per hr

IV. RESULT

This study was conducted at pathology laboratory of Presentation Center of Allied Science Puthenvelikara. A total of 50 students were participated in this study. From each of the participants 5 ml of BLD was collected and it is then divided into 3 parts. 1.6 ml BLD to 0.4ml 3.8% TSC tube, 1.6 ml to 0.4 ml NS tube. 3rd tube with 2 ml EDTA BLD and set for ESR and obtained result within 1 hour. The mean +SD value of ESR were 19.48+5.7 mm/hr in undiluted EDTA, 15.22+4.6 mm/hr in saline diluted EDTA & 15.36+4.5 mm/hr in TSC (TABLE 1).
The mean difference of ESR value between saline diluted EDTA with TSC BLD was 0 and it with undiluted EDTA was 4 mm /hr. The study indicates that there was a significant difference between ESR value with undiluted EDTA and TSC while diluted EDTA and TSC were there is no significant difference. The mean + SD of ESR value using undiluted, diluted EDTA and TSC in males were 16.20+3.3, 11.05+2.8, 11.29+2.6 (TABLE 2) and while it for females were 21.69+5.2, 17.36+3.8, 17.45+3.8 (TABLE 3) respectively.

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Table:1 Mean, SD and CV of EDTA Undiluted, EDTA diluted and TSC

	MEAN	SD	CV
EDTA UNDILUTED	19.48	5.7	3.4
EDTA DILUTED	15.22	4.6	3.3
TSC	15.36	4.5	\3.3

Fig:1 Mean value of EDTA Undiluted, EDTA diluted and TSC

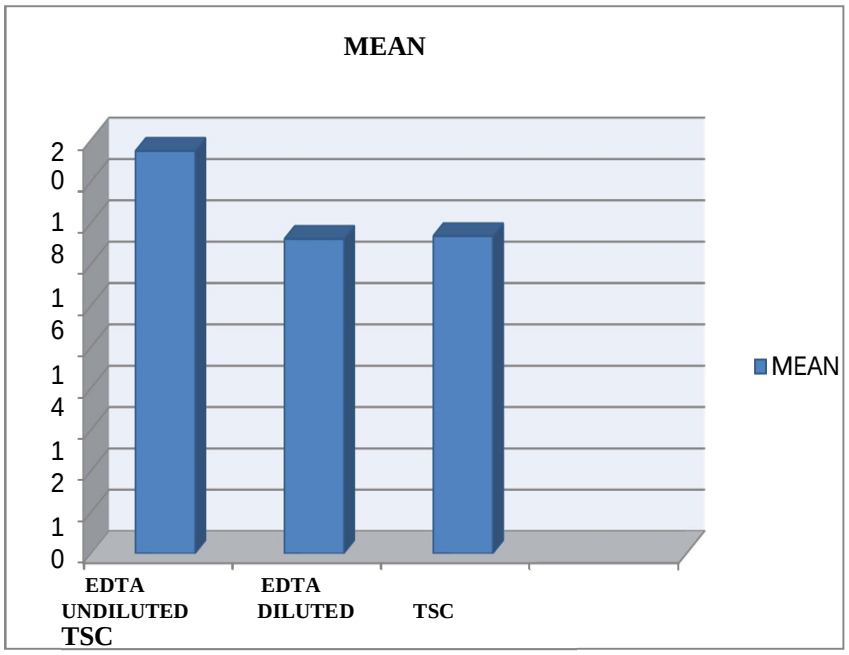


Fig:2 SD of EDTA Undiluted, EDTA diluted and TSC

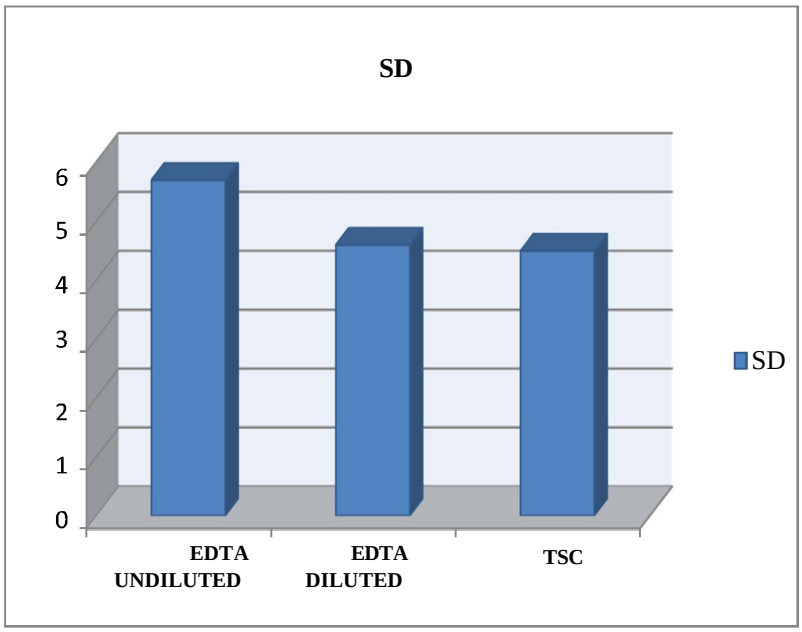


Fig:3 CV of EDTA Undiluted, EDTA diluted and TSC

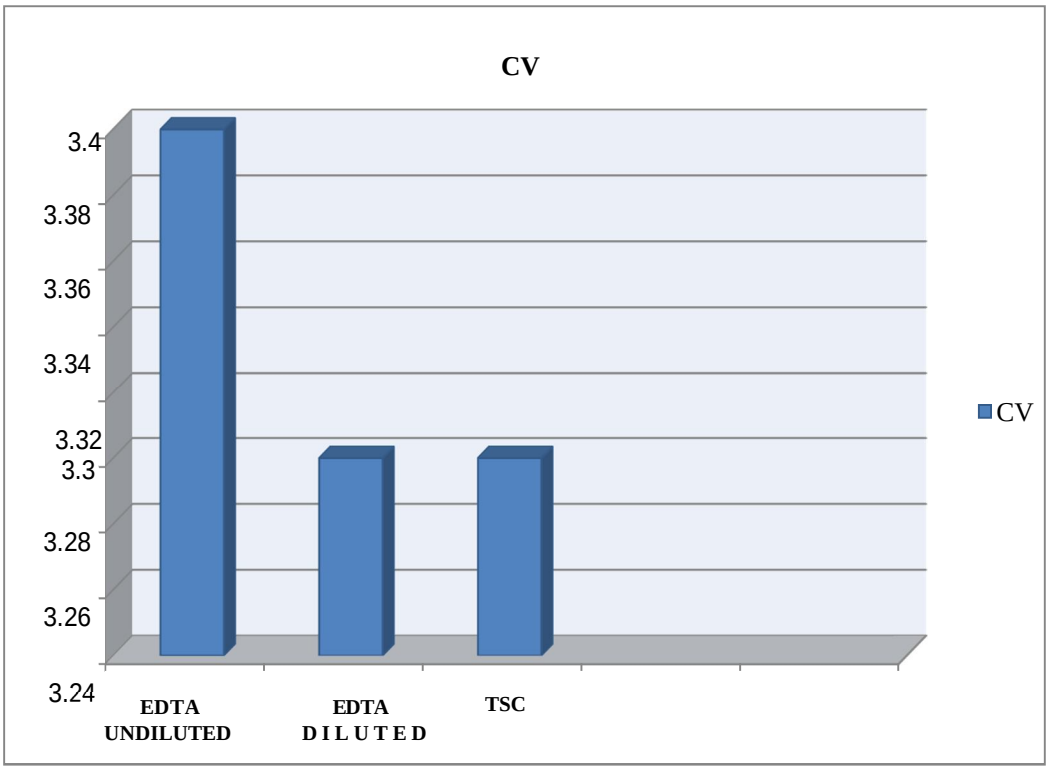


Table: 2 Mean ± SD of MALE

	MEAN	SD
EDTA UNDILUTED	16.20	3.3
EDTA DILUTED	11.05	2.8
TSC	11.29	2.6

Fig: 4 Mean ± SD of MALE

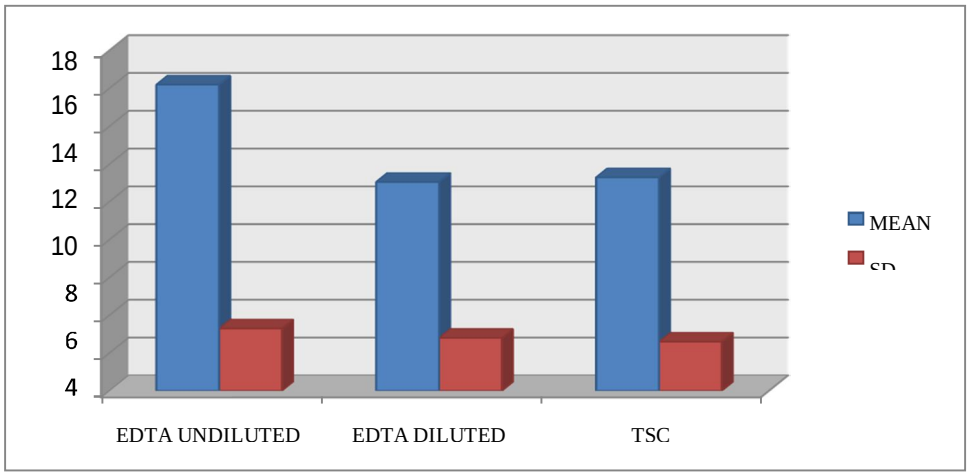


Table: 3 Mean ± SD of FEMALES

	MEAN	SD
EDTA UNDILUTED	21.69	5.2
EDTA DILUTED	17.36	3.8
TSC	17.45	3.8

Fig:5 Mean ± SD of FEMALE

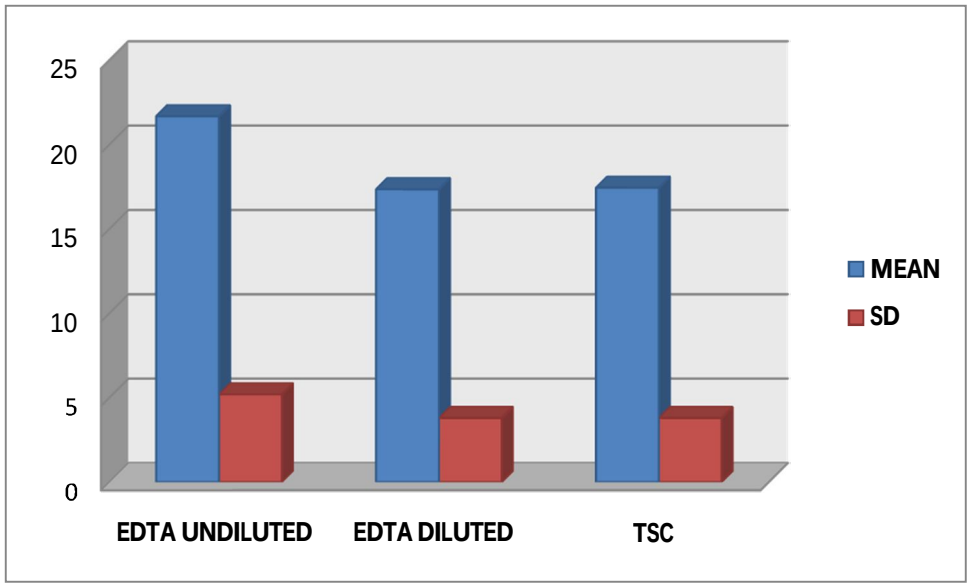
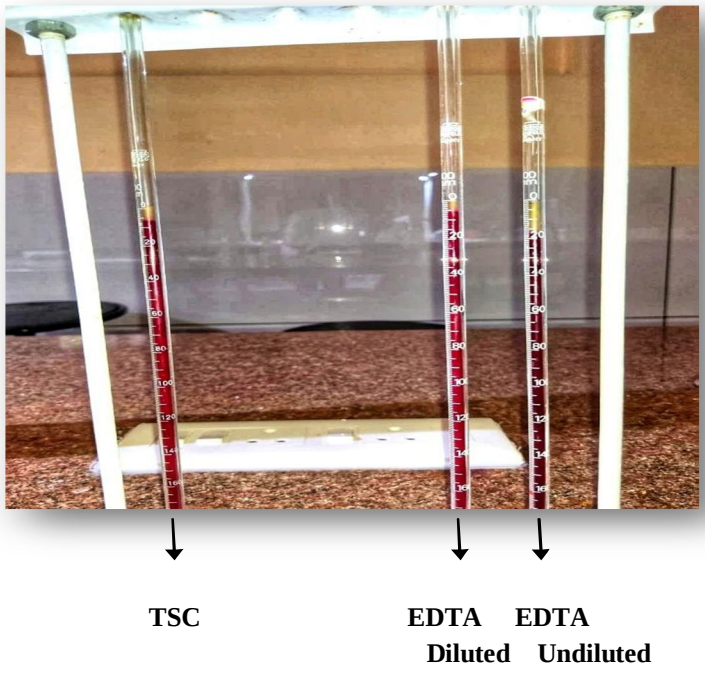


Fig: 6 ESR of TSC, EDTA Diluted, EDTA Undiluted



V. DISCUSSION

This study was aimed at analyzing the relationship between setting up ESR with TSC, NS and EDTA BLD in order to establish an acceptable method that may be cheaper but yield a reliable result. A comparison of ESR result obtained using the conventional diluents, TSC with those obtained with NS as a diluent should there is no significant difference between the two diluents. This observation is in agree with an earlier report by Emeribe and Ukonu, 1992 who stated that there is no significant difference in TSC and NS, setting ESR using EDTA BLD should a significant difference, as the value obtained was higher than TSC and NS respectively [11]. The reason for this observation may however be that TSC reduces rouleaux formation than EDTA BLD leading to increase ESR in EDTA BLD or it might be a difference in viscosity, where EDTA BLD may be less viscous than TSC resulting to higher values. ESR value of EDTA BLD was significantly higher than TSC. Therefore, disqualifies the use of EDTA BLD to set up ESR in contemporary medical laboratory. Females had higher ESR value than male which agrees with earlier report by (saadeh, 1998) [12,13]. The reason for this increase may be due to some physiological changes that occur in females like menstruation [14,15].

VI. CONCLUSION

In my study "A Comparitive Study of Erythrocyte Sedimentation Rate Using Saline Diluted and Undiluted EDTA with TSC" I Concluded that,

A. TSC is the best diluent to be used in contemporary lab to set ESR as compared to EDTA BLD. But we can use saline diluted EDTA as an alternative to citrate diluted BLD to set ESR.
B. It can conclude that EDTA BLD yields a different result with TSC BLD for ESR determination. Therefore, it is better to use only one of the two anticoagulants consistently as there is a difference between them.
C. This study also showed there is a gender wise variation in ESR using TSC, undiluted EDTA and diluted EDTA.

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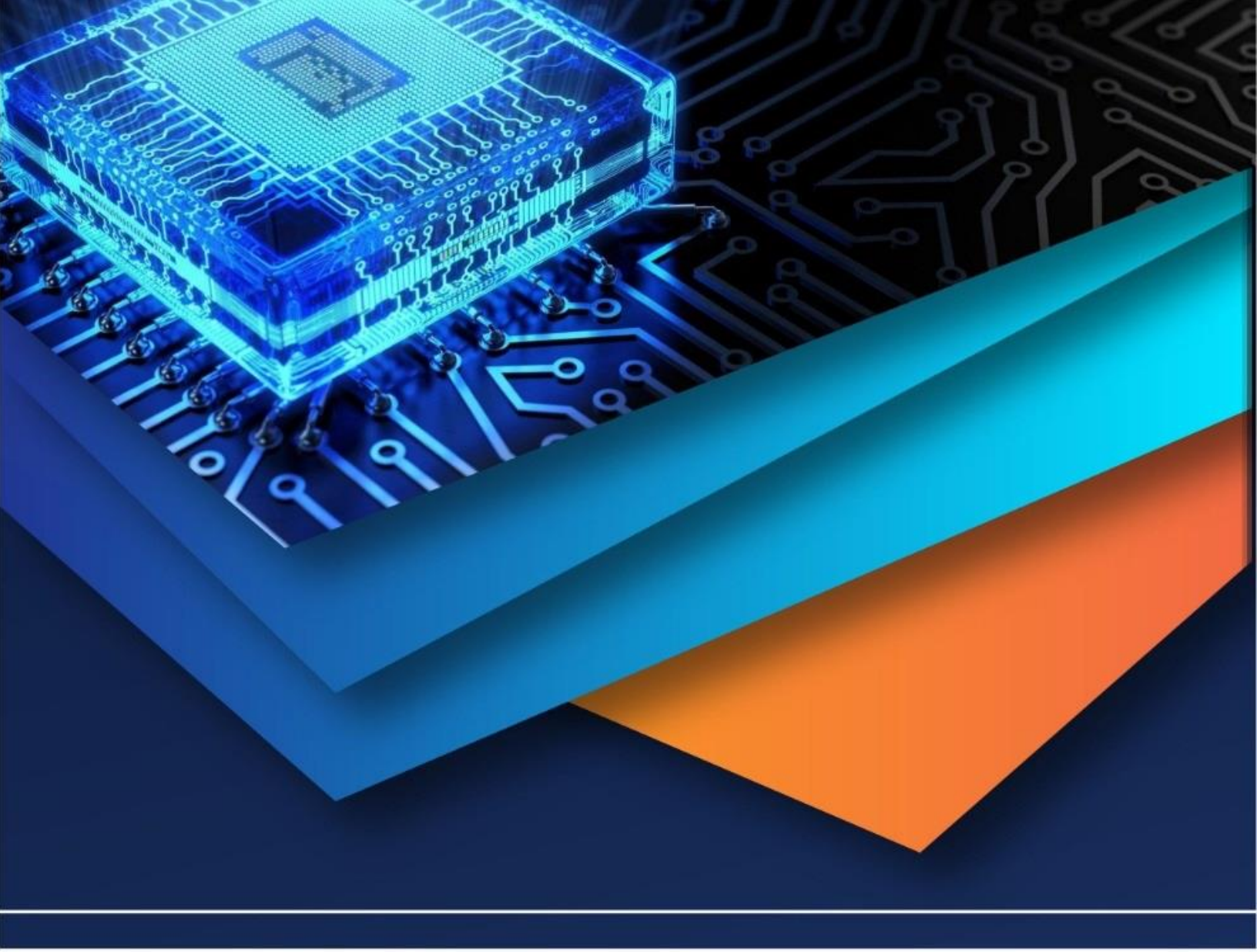

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