

## Main Topics

- 1 Thrombosis & Hemostasis
- 2 Regenerative Medicine
- 3 SCT
- 4 Anemia, Hemoglobinopathies
- 5 Case Presentations and Hematomorphology
- 6 Hematopoietic Malignancies
- 7 Free Papers

## Call for Abstract

Abstracts for oral free papers and posters are invited. It should be written on size A4, font 14 Arial, the title should be in Capital, names and affiliation of authors underlining the presenting author. It should be structured: Background, objectives, material and methods, results and conclusion. Corresponding author contact and 3-5 keywords should be provided. The deadline to receive abstracts is 25 September, 2019 and we will reply by 10 October, 2019 It should be submitted to conference secretariat

## Registration Fees

**L.E 400** Registration for the conference & Registration of the Egyptian society of Hematology and Research

200 \$ For Non-Egyptians	L.E 350 per nonmember delegates	L.E 300 per member delegates	L.E 200 Junior
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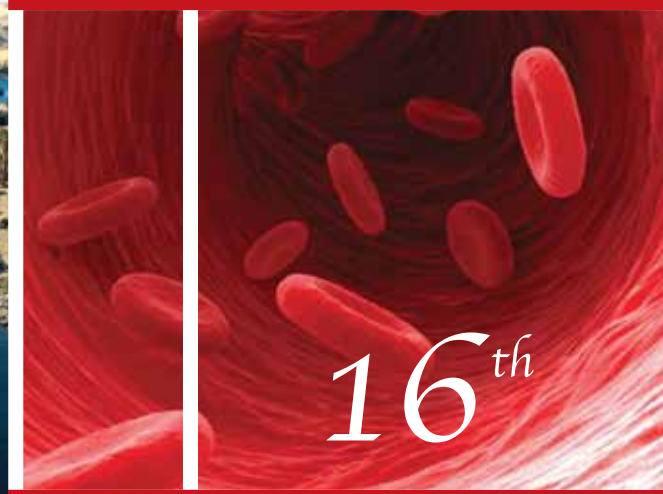
## Conference Secretariat

Pioneer Events  
30 Dr. Anwar El Mofti St., 61  
Nasr City, Cairo, Egypt  
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The Egyptian Society of  
Hematology & Research ( ESHR )  
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Fom El Khalig, Cairo, Egypt  
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## INTERNATIONAL CONFERENCE OF THE EGYPTIAN SOCIETY OF HEMATOLOGY AND RESEARCH (ESHAR) Update in Hematology



30 - 31 Oct., 2019  
Grand Nile Tower

**Honory President of the Conference & Society**  
**Prof. Faiza Hammouda**

**President of the Conference & Society**  
**Prof. Amal El Beshlawy**

**Vice President**  
**Prof. Azza Mostafa**

**Secretary General**  
**Prof. Azza Kamel / Prof. Mervat Matter**

## Welcome Message

Once again we meet in the 16<sup>th</sup> International Conference of the Egyptian Society of Hematology & Research (ESHR) that will be held at Grand Nile Tower, Cairo, on 30-31 October, 2019.

On behalf of the scientific and organizing committees, we would like to invite you to attend the most enlightening experience in Hematology.

The Conference will cover the different aspects of both clinical and laboratory hematology including Thrombosis and hemostasis, Anemia, Oncologic Hematology, BMT and Hemato-morphology. The conference will highlight the most recent issues and the topics that are still controversial. National as well as International figures in hematology will address the conference with state of art lectures in the various topics.

Finally we hope this conference will help to enhance the clinical and laboratory skills and knowledge of participants and enable them to discuss with speakers all aspects of Hematology.

**President of the Conference**  
**Prof. Amal Elbeshlawy**



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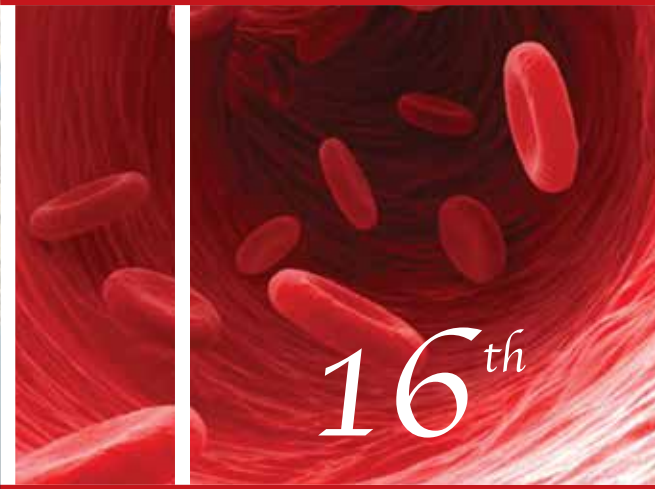
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**INTERNATIONAL CONFERENCE OF  
THE EGYPTIAN SOCIETY OF  
HEMATOLOGY AND RESEARCH (ESHR)  
Update in Hematology**



30 - 31 Oct., 2019  
Grand Nile Tower

**Under the patronage of  
Prof. Hala Salah  
(Dean of Faculty of Medicine, Cairo University)**

**Honory President of the Conference & Society  
Prof. Faiza Hammouda**

**President of the Conference & Society  
Prof. Amal El Beshlawy**

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# *Welcome Messages*

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Finally we hope this conference will help to enhance the clinical and laboratory skills and knowledge of participants and enable them to discuss with speakers all aspects of Hematology.

**President of the Conference**  
**Prof. Amal El Beshlawy**

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# Acknowledgement

The Organizing committee would like to sincerely thank the main sponsors of the meeting namely **Novartis, Roche, Sanofi, Pfizer, Takeda, Novonordisk, Jansen, Amgen and other Companies.**

Without the generous support of these companies the meeting would not have been possible .Also we would like to thank **all other companies who supported the conference** and the activities of the **ESHR** conference.

**The Organizing Committee**

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# *Committees*

## **Organizing Committee**

President: Prof. : Somaya El Gawhary

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# *General Information*

## **Official Language**

The official language of the congress is English.

## **Time Difference**

Egypt time is 2 hours ahead of Greenwich Mean Time (GMT+2).

## **Climate**

Egypt has a warm and sunny climate all year round, although on the whole it can be best described as mild. While the mid summer months can get quite hot, the heat is less taxing than else-where because of low humidity.

For the rest of the year the weather is ideal, and sunny. Rainy days are few and far between in Cairo, and nearly unknown in Upper Egypt.

Therefore, it would be wise to pack both lightweight and warm clothing.

## **Electricity**

Electricity Outlets for 220 volts are dominant in Egypt. Always check the power supply before using your equipment.

## **Liability and Insurance**

The Organizing Committee will take no liability for personal injuries sustained by or for loss or damage to property, belongings of congress participants or accompanying persons, either during or as a result of the congress or during their stay in Egypt. It is, therefore, advised that participants arrange their own personal health, accident and travel insurance.

## **Business Hours**

Friday is the official weekend. Most embassies are closed Friday and Saturdays, but few close on Saturdays and Sunday. Shops are generally open from 9:00 to 21:00 hours and most of them close on Sunday.

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## **Tipping**

Whilst tipping is not essential, people who provide a service, for example, hotel porters, waiters, drivers and guides generally expect some tipping . There is no set amount of tip given, it is left to the individual as appreciation of service provide.

## **Badges**

You will receive your name badge on registration. For security and administrative reasons you should wear your name badge throughout the conference, breaks, and exhibition hall.

## **Certificate of Attendance**

Certificate of Attendance will be delivered on the second day at the registration desk .

## **Coffee Breaks**

It will be served in the foyer in front of Conference rooms.

## **Exhibition Hall**

Medical Industry and Pharmaceutical companies will be present in the foyer in front of the Conference rooms. Please feel free to visit the medical exhibition during the breaks.

## **Information Desk**

For any inquiries please contact the organizers.

## **Mobile Phones**

Mobile Phones must be switched off inside the meeting rooms.

## **Lost and Found**

For your missing or lost items contact the Conference Information Desk.

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## **Medical Emergencies**

Please contact the emergency phone numbers or Conference Information Desk.

## **Preview Room**

All Speaker are kindly requested to deliver their presentation at least 2 hours before their talk to the slide room which will be beside the meeting room.

## **Conference Secretariat**

Pioneer Events

30 Anwar El Mofti St., Nasr City

Cairo, Egypt

Tel : 202 24053775

Fax : 202 24020609

Mobile: 010 05399162

E-mail: [mai@pioneer-events.org](mailto:mai@pioneer-events.org)

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# *Program at a Glance*

## **Wednesday 30<sup>th</sup> October 2019**

08:30 - 09:30	Registration
09:30 - 10:00	Opening Ceremony
10:00 - 11:30	Thrombosis and Hemostasis
<b>11:30 - 12:00</b>	<b>Coffee Break</b>
12:00 - 13:30	Advances In Hemoglobinopathies (Novartis Symposium)
13:30 - 14:00	Plenary Session
14:00 - 15:20	Gaucher and Hematological Diseases; The Egyptian Experience (Sanofi -Genzyme Symposium)
<b>15:20 - 15:45</b>	<b>Coffee Break</b>
15:45 - 16:45	Bleeding Disorders In Pediatric And Adults (Amgen Symposium)
16:45 - 17:30	Short talks
<b>17:30</b>	<b>Lunch Together</b>

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## Thursday 31<sup>th</sup> October 2019

10:00 - 11:30	Hemato-Oncology
<b>11:30 - 12:00</b>	<b>Coffee Break</b>
12:00 - 13:30	Non-Chemotherapy Treatment Modalities in Hematological Malignancies
13:30 - 14:30	New Horizons in CLL and Jansen Symposium
<b>14:30 - 15:00</b>	<b>Coffee Break</b>
15:00 - 16:20	Hemophilia and Rare Bleeding Disorders Update in Management (Roche Symposium), (Novo Novonordisk Symposium) and (Amgen Symposium)
16:20 - 17:20	Case Presentation
17:30	Lunch Together

---

# Program Details

## Wednesday 30<sup>th</sup> October 2019

**08:30 - 09:30** | **Registration**

**09:30 - 10:00** | **Opening Ceremony**

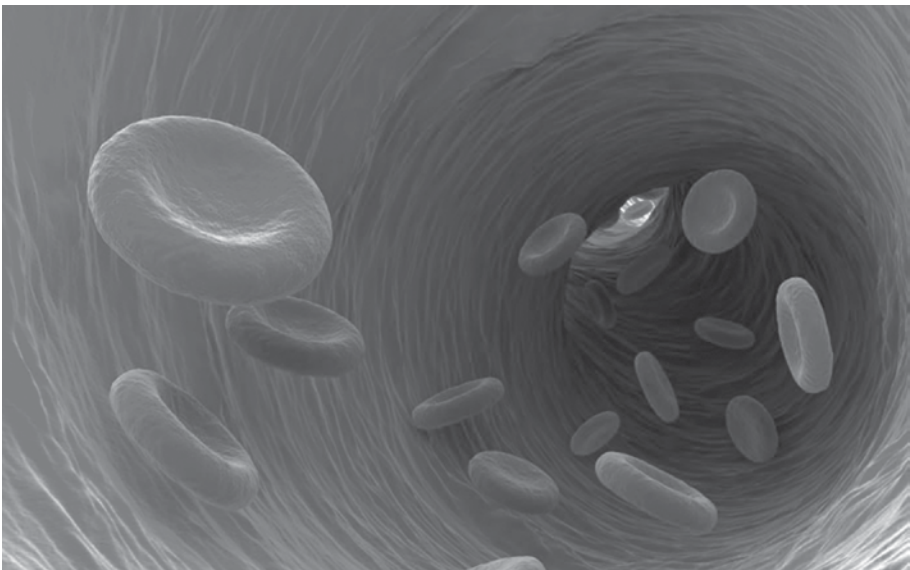
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*(Dean of Faculty of Medicine, Cairo University)*

*Prof. Amal El Beshlawy (ESHR President)*

*Prof. Azza Mostafa (ESHR Vice President)*

*Prof. Somaya El Gawhary (ESHR Treasurer)*



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**Wednesday 30<sup>th</sup> October 2019**

**I- Thrombosis and Hemostasis  
(10:00 - 11:30)**

**Chairpersons**

Prof. Naguib Zoheir

Prof. Azza Eldanasory

Prof. Seham Ragab

Prof. Amina Hassab

10:00 - 10:20	Approach to diagnosis of platelet defects <b>Prof. Nevine Kassim (Ain Shams University)</b>
10:20 - 10:40	Updates in understanding TTP <b>Prof. Hanan Hamed (Ain Shams University)</b>
10:40 - 11:00	Debates in venous thromboembolism disease management <b>Prof. Sahar Nassef (Ain Shams University)</b>
11:00 - 11:20	Procoagulant platelets: from thrombosis to future therapeutic opportunities <b>Prof. Nesma Safwat (Ain Shams University)</b>
11:20 - 11:30	Discussion
<b>11:30 - 12:00</b>	<b>COFFEE BREAK</b>



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**Wednesday 30<sup>th</sup> October 2019**

**II- Advances In Hemoglobinopathies  
(Novartis Symposium)  
(12:00 - 13:30)**

**Chairpersons**

Prof. Normeen Kaddah

Prof. Lamis Ragab

Prof. Galila Mokhtar

Prof. Osama El-Safy

12:00 - 12:30	Real and Future Outlook for Thalassemia Patients <b>Prof. Amal ElBeshlawy (Cairo University)</b>
12:30 - 12:45	Sickle cell disease update in management <b>Prof. Mona Elghamrawy (Cairo University)</b>
12:45 - 13:00	Thalassemia from out box <b>Consultant. Naglaa Shaheen (Health Insurance Organization)</b>
13:00 - 13:15	Challenges in a child with thalassemia <b>Prof. Laila Sherif (Zagazig University)</b>
13:15 - 13:30	Discussion

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**Wednesday 30<sup>th</sup> October 2019**

**III-Gaucher and Hematological Diseases; The Egyptian  
Experience (Sanofi -Genzyme Symposium)  
(14:00 - 15:20)**

**Chairpersons**

Prof. Amal El Beshlawy

Prof. Somaya El Gawhary

Dr. Reda Abd Allah

Consultant . Khaled Abdel Azim

14:00 - 14:30	Gaucher Disease What and Where in EGYPT? <b>Prof. Amal Elbeshlawy (Cairo University)</b>
14:30 - 14:50	Gaucher or Not Gaucher? <b>Prof. Amira Abd El Monem (Ain Shams University)</b>
14:50 - 15:10	Twenty years with Gaucher Disease <b>Consultant Khaled Abd El Azzim (Cairo University)</b>
15:10 - 15:20	<b>Discussion</b>
<b>15:20 - 15:45</b>	<b>COFFEE BREAK</b>

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**Wednesday 30<sup>th</sup> October 2019**

**VI - Bleeding Disorders In Pediatric And Adults  
(15:45 - 16:45)**

**Chairpersons**

Prof. Mona El Tagui

Prof. Youssria Abd El Rhman

Prof. Magdy El-Bordiny

Prof. Aida Nazir

Prof. Mona Hamdy

15:45 - 16:05	<b>(Amgen Symposium)</b> Immune & nonimmune pediatric thrombocytopenia <b>Prof. Mona El Tagui</b> <b>(Kasr Alainy-Cairo University)</b>
16:05 - 16:20	Platelet disorders in pregnancy <b>Prof. Alia Abdelaziz</b> <b>(Kasr Alainy-Cairo University)</b>
16:20 - 16:35	Bleeding disorders in the elderly <b>Prof. Mohamed Talaat</b> <b>(Kasr Alainy-Cairo University)</b>
16:35 - 16:45	<b>Discussion</b>

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**Wednesday 30<sup>th</sup> October 2019**

**V-Short talks  
(16:45 - 17:30)**

**Chairpersons**

Prof. Ragia Badawi

Prof. Hassan Abd El Ghaffar

Prof. Nadia Zaki

Prof. Basma Abd El Moaz

16:45 - 16:55	Assessment of Platelet Glycoprotein (GP IIb/IIIa) Gene Polymorphism as a potential Risk Factor in Ischemic Stroke Patients <b>Dr. Doha Abdelhamid (Suez canal University)</b>
16:55 - 17:05	Vitamin D Status and Vitamin D Receptor Gene Polymorphisms In Immune Thrombocytopenic Purpura <b>Prof. Iman Shaheen (Cairo University)</b>
17:05 - 17:20	Ethical and Legal Issues in scientific Pediatrics Researches <b>Dr. Hanaa Diab Khalafalla (Faculty of Nursing, Cairo University)</b>
17:20 - 17:30	<b>Discussion</b>

**17:30**

**Lunch Together**

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**Thursday 31<sup>th</sup> October 2019**

**VI - Hemato-Oncology  
(10:00 - 11:30)**

**Chairpersons**

Prof. Wafaa El Metnawy

Prof. Alaa Haddad

Prof. Salah Aref

Prof. Nadia Mowafi

10:00 - 11:00	Lab-Clinician Interaction (Cairo University) Clinicians <b>Prof. Omar Abdelrahman Fahmy (Cairo University)</b> <b>Prof. Mohamed Abdelmoaty (NCI Cairo University )</b> Lab <b>Prof. Maha Saleh ((NCI- Cairo University)</b> <b>Prof. Iman Zaghloul (NCI- Cairo University)</b> <b>Prof. Heba Mousa (NCI- Cairo University)</b>
11:00 - 11:20	Updates in Haplo-identical Transplants <b>General Dr. Mohamed Khalaf</b>
11:20 - 11:30	<b>Discussion</b>
<b>11:30 - 12:00</b>	<b>COFFEE BREAK</b>

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**Thursday 31<sup>th</sup> October 2019**

**VIII- Non-Chemotherapy Treatment Modalities in  
Hematological Malignancies  
(12:00 - 13:30)**

**Chairpersons**

Prof. Manal ElSorady

Prof. Maha Elzemiety

Prof. Emad Azmy

Prof. Essam AbdelMohsen

Prof. Gamal Fathy

12:00 - 12:20	Non-Chemotherapy Treatment Modalities in Non Hodgkin lymphoma <b>Prof. Mohamed Azazi (Ain Shams University)</b>
12:20 - 12:40	Non-Chemotherapy Treatment Modalities in Hodgkin's lymphoma <b>Prof. Mohamed Mousa (Ain Shams University)</b>
12:40 - 13:00	Non-chemotherapy treatment modalities in Multiple Myeloma <b>Prof. Ashraf Elghandour</b>
13:00 - 13:20	Tumor infiltrating lymphocyte immunotherapy speeds up <b>Prof. Manal Elmasry (Cairo University)</b>
13:20 - 13:30	<b>Discussion</b>

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**Thursday 31<sup>th</sup> October 2019**

**VII-New Horizons in CLL  
(13:30 - 14:30)**

**Chairpersons**

Prof. Mervat Mattar

Prof. Adel Abdel-Rehim

Prof. Amal Zidan

13:30 - 13:50 | CLL; The art of diagnosis  
**Prof. Hala Farawela**  
**(Cairo University)**

**Jansen Symposium**

13:50 - 14:05 | Frontline Therapy of CLL  
**Prof. Mervat Mattar**  
**(Cairo University)**

14:05 - 14:20 | Refractory and Relapsed CLL  
**General Dr. Mahmoud Salah**  
**(Cairo University)**

14:20 - 14:30 | **Discussion**

**14:30 - 15:00** | **COFFEE BREAK**

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**Thursday 31<sup>th</sup> October 2019**

**IX-Hemophilia and Rare Bleeding Disorders  
Update in Management  
(15:00 - 16:20)**

**Chairpersons**

Prof. Amal El Beshlawy

Dr. Magda Rakha

Prof. Mohamed Badr

Prof. Ahmed Mansour

Consultant Naglaa Omar

- |               |  |
|---------------|--|
| 15:00 - 15:30 | <b>(Roche Symposium)</b> Update In Hemophilia Breakthrough Management<br><b>Prof. Mervat Mattar (Cairo University)</b>                                     |
| 15:30 - 15:50 | <b>(Novo Nordisk Symposium)</b> Rare Hereditary Bleeding Disorders Update in Management<br><b>Consultant Naglaa Shahin (Health Insurance Organization)</b> |
| 15:50 - 16:05 | Hemophilia in Egypt What we Need<br><b>Prof. Sonia Adolf (NRC)</b>   |
| 16:05 - 16:20 | <b>(Amgen Symposium)</b> Thrombocytopenia in adult<br><b>Prof. Mervat mattar (Cairo University)</b>  |



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**Thursday 31<sup>th</sup> October 2019**

**X-Case Presentation  
(16:20 - 17:20)**

**Chairpersons**

Prof. Azza Mostafa

Prof. Iman Mansour

Prof. Basma Elgama

Prof. Hala Farawela

16:20 - 17:20

Coagulation case

**Dr. Wafaa Abdelghany ( Cairo University)**

**Dr. Lamiaa Abdelfattah Fathalla**

**(NCI-Cairo University)**

**Prof. Iman Shaheen (Cairo University)**

**Prof. Hanan El Wakeel (Cairo University)**

**Dr. Sherihan Mahgoub (Cairo University)**

**Dr. Randa Amin Osman (Cairo University)**

**17:30**

**Farewell Lunch**

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# Abstract

## **Challenges of Children with Thalassemia**

*Laila Sherief*

*Professor of Pediatric and Pediatric Hematology & Oncology*

*Zagazig University*

Thalassemia is the most common chronic hereditary disease that is seen in almost all races globally and is transmitted from parents to children. Approximately 240 million of the world's population are carriers of beta-thalassemia, and according to the Thalassemia International Federation statistics, ~200,000 patients with thalassemia major are treated worldwide. Thalassemia is a serious and life-limiting and potentially life-threatening disease that causes substantial disruption in all dimensions of life. Thalassemia is usually diagnosed when the child is a few months old. The pressure caused by having a child who requires extreme care and regular blood transfusions leads to an unsettled mental balance in parents. Trauma incurred to the family causes different psychological reactions in them, and family relationships are seriously affected. Patient care undermines the energy level of family members and puts them at risk of physical, emotional and isolation consequences, and causes despair, frustration, helplessness, fear, shame and a desire to die. In a study, academic problems (60%), problems with social interactions (20%) and feeling of being different (24%) and anxiety (31%) were reported in children with thalassemia. These patients, like other patients with chronic and debilitating diseases, require permanent lifelong treatment and struggle with several mental health challenges, and social and economic problems, each of which somehow interferes with the principles of treatment and follow-up. Therefore, identifying the challenges facing children and their parents may lead to proper understanding of their individual needs and effective use of supportive and care programs.

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## Assessment of Platelet Glycoprotein (GP IIb/IIIa) Gene Polymorphism as a potential Risk Factor in Ischemic Stroke Patients

Doha A. Abd El Hamid<sup>1</sup>, Fadia M. Attia<sup>1</sup>, MD, Ahmad O. Hosny<sup>2</sup>, MD, Mohammad A. Samahy<sup>2</sup>, MD, Gihan A. Ibrahim<sup>1</sup>, MD

1 Department of Clinical Pathology, Faculty of Medicine, Suez Canal University

2 Department of Neurology, Faculty of Medicine, Suez Canal University

**Background:** Ischemic cerebrovascular stroke has been named as the third leading causes of morbidity and mortality worldwide; numerous biological molecules and mechanisms were found to be associated with stroke. Advances in molecular techniques exploring genetic variants predisposing to cerebrovascular diseases could potentially a useful tool in clinical setting.

**Aim:** To assess the genetic platelet glycoprotein (GPIIb/IIIa) polymorphism, as a possible genetic risk factor in ischemic cerebrovascular stroke patients in Suez Canal University Hospital, Ismailia, thus allowing early detection of patients at risk with consequent prevention of occurrence of stroke, thereby reducing morbidity and mortality.

**Subjects and Methods:** Fifty adult ischemic stroke male and female patients (acute, recent or old) and fifty-healthy age and gender matched control group were included in the study. Molecular assessment included DNA extraction and purification using micro-centrifugation technique. DNA amplification was carried out by PCR. GPIIb/IIIa Genotyping was carried out by RFLP using the restriction enzyme Msp-I and detected by 1.5% agarose gel electrophoresis.

**Results:** A statistically significant difference was detected and showed an increase in the risk of occurrence of ischemic cerebrovascular stroke when the platelet glycoprotein GPIIIa (PIA2/PIA2) mutant allele was detected; 10% (5 patients) of the study group patients expressed the mutant allele versus 2% (1 healthy individual) of the control group with a p value of 0.024. There were statistically significant differences between the study groups that showed an increased risk regarding smoking, hypertension, dyslipidemia and diabetes, with p values of <0.001, 0.001, <0.001 and 0.003 respectively. Dyslipidaemia showed the highest odds ratio of all the risk factors of 11.227 and residence showed the lowest 0.617.

**Conclusions:** GPIIIa (PIA1/PIA2) polymorphism is a reliable and significant predictor biomarker for the prediction of ischemic cerebrovascular stroke. Platelet glycoprotein GPIIIa (PIA2/PIA2) mutant allele was identified as a risk factor ischemic cerebrovascular stroke.

**Key words:** Cerebrovascular Stroke, Platelet Glycoprotein (GP IIb/IIIa), Gene polymorphism.

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## **Vitamin D Status And Vitamin D Receptor Gene Polymorphisms In Immune Thrombocytopenic Purpura**

*Iman Shaheen PhD<sup>1</sup>, Omnia Abdeldayem PhD<sup>1</sup>, Reham Emadeldien PhD<sup>1</sup>, Nelly Abulata PhD<sup>1</sup>, Rasha Abdel-Raouf PhD<sup>2</sup>, Basant Meligy PhD<sup>2</sup>.*

*<sup>1</sup>: Clinical and Chemical Pathology Department, Faculty of Medicine, Cairo University.*

*<sup>2</sup>: Pediatric Department, Faculty of Medicine, Cairo University.*

### **The corresponding author**

Iman Abdelmohsen Shaheen, PhD.

Professor of Hematopathology, Department of Clinical and chemical pathology, Cairo University, Cairo, Egypt.

Address; Department of Clinical and Chemical Pathology, Faculty of Medicine, Cairo University, Egypt

### **Background:**

Idiopathic Thrombocytopenic Purpura (ITP) is a heterogeneous immunological disorder. Vitamin D has various antiinflammatory and immunomodulatory effects, along with its major role in bone mineral homeostasis. Accordingly, it is considered as a physiological hormone. The pleiotropic effects of vitamin D are exerted via vitamin D receptor (VDR), which genetic alterations could influence its functions. The socioeconomic and changing life style of a great sector of Egyptians could affect Vitamin D levels, which in conjunction with the genetic status of VDR could affect its immunological function and contributed in the pathogenesis of pediatric ITP.

### **Objectives:**

To analyze serum vitamin D level and four genetic polymorphisms in VDR; FokI, BsmI, Apal and TaqI among Egyptian pediatric and adolescence ITP patients and age-gender matched healthy individuals to evaluate its contribution to ITP susceptibility and its correlation with the clinical features of the patients. Material and methods: Ninety eight primary ITP children and 100 age and sex matched healthy control subjects were enrolled in this study. Serum 25(OH) D levels were measured using ELISA. Genotyping of the studied polymorphisms of VDR was performed by polymerase chain reaction restriction fragment length polymorphism (RFLP).

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**Results:**

Low vitamin D serum levels were not associated with pediatric ITP. Carriers of FokI homomutanat variant had significantly lower Vitamin D levels. Carriers of BsmI G allele conferred nearly two folds increased risk for ITP.

**Conclusion:**

Vitamin D deficiency is common in pediatric age group involved in the current study, with significant lower values in carries of FokI homomutant genotype . BsmI polymorphism of VDR could be considered as a molecular risk factor for ITP in Egyptians.

**Key words:**

ITP, VDR, FokI, BsmI , ApaI, TaqI , Egypt

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## **Ethical and Legal Issues in scientific Pediatrics Researches**

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Legal and ethical issues form an important component in pediatric researches for the protection of dignity of the children. These legal and ethical issues based on primary and secondary principles. The primary principles are informed consent, beneficence, non-maleficence, autonomy, Justice. The secondary principles include fidelity, veracity and confidentiality....etc. Nurses and pediatric health care providers should be aware of and adhere to all ethical and legal issues when conducting pediatric clinical researches for safety and protecting children rights. In addition, good quality research is crucial for determining the clinical and cost effectiveness of health care systems.

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## **Tumor-infiltrating lymphocyte immunotherapy speeds up**

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Mounting evidence of efficacy in tumors is driving clinical investment in tumor-infiltrating lymphocytes (TILs). TILs react against tumor cells. Ex vivo expansion of TILs for return to patients is. Extracting T cells from a patient's tumor, expanding them ex vivo and re-injecting them—is one of several TIL treatments showing encouraging results in the lab and clinic. TIL therapy has always faced two major limitations: growing TILs is a tricky, time-consuming and individualized laboratory procedure; and TILs showed limited activity in any cancer except melanoma. Researchers are now achieving broader success and challenging these limitations. As now that companies have commercialized chimeric antigen receptor T cells (CAR-Ts), groups pursuing TILs are eager to follow suit, expanding patient TILs at centralized manufacturing sites before freezing and delivering them to hospitals to give to patients (1).

TILs, unlike treating with immuno-therapy targeting programmed cell death receptor 1 (PD-1) and also unlike CAR-T cells and T cells with engineered T cell receptors are not genetically modified. The basic method: technicians chop up a surgically resected tumor and place it in culture medium with growth factors, typically interleukin-2 and a CD3 agonist to stimulate T cell proliferation in-order to let the T cells spill out of the tumor cells and start growing (2).

To help condition the body for the TIL transplant, patients receive a reversible lympho-depleting chemotherapy regimen before infusion. This step eliminates competition for growth-promoting cytokines and removes suppressor cells like T regulatory cells (Tregs) and myeloid-derived suppressor cells. Lympho-depletion gives a head start to the T cells that are infused. Such T cells can be remarkably long-lived that has been detected in large numbers in successfully treated patients five years after infusion. Researchers have also improved their ability to harvest and expand T cells and reported success in harvesting TILs from over 90% of patients with bulky tumors. To boost tumor killing, only tumor neoantigen-reactive T cells among patients' TILs

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were selected. First they isolate tumor DNA or RNA, and use whole exome or transcriptome sequencing to identify all amino acid-altering mutations by comparison with sequenced normal tissue. Then designing gene constructs containing sequences for all the mutant peptides that could be displayed on the major histo-compatibility complex (MHC) of antigen-presenting cells. They then string sequences together into 'tandem mini-genes' and insert them into the patient's own antigen-presenting cells, to test patient T cells for reactivity. The reactive T cells, expanded in culture, are re-infused into the patient (3).

**Key words:**

TILs, Tumour Infiltrating Lymphocytes; PD-1, programmed cell death receptor 1; chimeric antigen receptor T cells (CAR-Ts); Tregs, T regulatory cells.

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