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والصيدلة - مراكش
FACULTÉ DE MÉDECINE
ET DE PHARMACIE - MARRAKECH
MARRAKECH
جامعة القاضي عياض
UNIVERSITÉ CADI AYYAD

Year 2024 Thesis N° 157

Post Intensive Care Syndrome (PICS) : an overview of the cognitive and psychological impairments in Moroccan adult ICU

THÈSE

PRESENTED AND PUBLICLY DEFENDED ON 26 /04 /2024

by

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Born on the 4th of September 1997 in Marrakech

TO OBTAIN A MEDICAL DOCTORATE

KEYWORDS

ICU – Psychological– PICS – WHODAS2.0–Cognitive

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بسم الله الرحمن الرحيم
سبحانك لا علم لنا إلا ما علمتنا
إنك أنت العليم الحكيم
صدق الله العظيم
سورة البقرة الآية 31
اللهم إنا نسألك علما نافعا و قلبا خاشعا وشفاء
من كل داء و سقم

It is dangerous nonsense to assert that in the practice of their art and science physicians can rely on their benevolent intentions, their abilities to judge what is the right thing to do . It is not that easy. Medicine is a complex profession and the interactions between physicians and patients are also complex.

-Dr.Jay Katz, The Silent World Between Doctor and Patient-

HIPPOCRATIC OATH

At the time of being admitted as a member of the medical profession:I solemnly pledge to dedicate my life to the service of humanity; the health and well-being of my patient will be my first consideration;I will respect the autonomy and dignity of my patient; I will maintain the utmost respect for human life; I will not permit considerations of age, disease or disability, greed, ethnic origin, gender, nationality, political affiliation, race, sexual orientation, social standing or any other factor to intervene between myduty and my patient;

I will respect the secrets that are confided in me, even after the patienthas died; I will practice my profession with conscience and dignity and inaccordance with good medical practices; I will foster the honor and noble traditions of the medical profession;I will give to my teachers, colleagues, and students the respect and gratitude that is their due I will share my medical knowledge for the benefit of the patient andthe advancement of healthcare; I will attend to my health, well-being, and abilities in order toprovide care of the highest standard; I will not use my medical knowledge to violate human rights and civilliberties, even under threat; I make these promises solemnly,

freely and upon my honour.

Declaration of Geneva, 1948

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311	ABI EL AALA Khalid	Pr Ass	Pédiatrie
312	AFANI Leila	Pr Ass	Oncologie médicale
313	EL MOULOUA Ahmed	Pr Ass	Chirurgie pédiatrique
314	LAGRINE Mariam	Pr Ass	Pédiatrie
315	OULGHOUL Omar	Pr Ass	Oto-rhino-laryngologie
316	AMOCH Abdelaziz	Pr Ass	Urologie
317	ZAHLAN Safaa	Pr Ass	Neurologie
318	EL MAHFOUDI Aziz	Pr Ass	Gynécologie-obstétrique
319	CHEHBOUNI Mohamed	Pr Ass	Oto-rhino-laryngologie
320	LAIRANI Fatima ezzahra	Pr Ass	Gastro-entérologie
321	SAADI Khadija	Pr Ass	Pédiatrie
322	DAFIR Kenza	Pr Ass	Génétique
323	CHERKAOUI RHAZOUANI Oussama	Pr Ass	Neurologie
324	ABAINOU Lahoussaine	Pr Ass	Endocrinologie et maladies métaboliques
325	BENCHANNA Rachid	Pr Ass	Pneumo-phtisiologie
326	TITOU Hicham	Pr Ass	Dermatologie

327	EL GHOUL Naoufal	Pr Ass	Traumato-orthopédie
328	BAHI Mohammed	Pr Ass	Anesthésie-réanimation
329	RAITEB Mohammed	Pr Ass	Maladies infectieuses
330	DREF Maria	Pr Ass	Anatomie pathologique
331	ENNACIRI Zainab	Pr Ass	Psychiatrie
332	BOUSSAIDANE Mohammed	Pr Ass	Traumato-orthopédie
333	JENDOUZI Omar	Pr Ass	Urologie
334	MANSOURI Maria	Pr Ass	Génétique
335	ERRIFAIY Hayate	Pr Ass	Anesthésie-réanimation
336	BOUKOUB Naila	Pr Ass	Anesthésie-réanimation
337	OUACHAOU Jamal	Pr Ass	Anesthésie-réanimation
338	EL FARGANI Rania	Pr Ass	Maladies infectieuses
339	IJIM Mohamed	Pr Ass	Pneumo-phtisiologie
340	AKANOUR Adil	Pr Ass	Psychiatrie
341	ELHANAFI Fatima Ezzohra	Pr Ass	Pédiatrie
342	MERBOUH Manal	Pr Ass	Anesthésie-réanimation
343	BOUROUMANE Mohamed Rida	Pr Ass	Anatomie
344	IJDDA Sara	Pr Ass	Endocrinologie et maladies métaboliques

LISTE ARRETEE LE 09/01/2024

DEDICATION

I dedicate this thesis to …

I express gratitude to the Almighty for the countless blessings bestowed upon me throughout my life and continuing to do so. His guidance has brought me to where I stand today, and without it, navigating this journey would have been insurmountable. I shall remain forever grateful, dedicated to serving as His humble servant for eternity.

To my entire family

I want to express my heartfelt gratitude to each of you for your support and contributions to the woman I have become today. Your help and the lessons I've learned from you over the years mean more to me than words can express. A special thank you goes to my aunt B. Hind for everything; your presence has left an indelible mark on my life since my childhood. I am thankful to each of you—B. Itbtissam, B. Ilhame, B. Soufiane, N. Aicha, B. Mohamed, and M. Latifa for everything.

To my childhood friend

Chahberrase Houda I'm grateful for all the wonderful memories we've shared; it feels like we've grown up together, almost like sisters. Having you by my side, sharing the same mindset of growth, is truly a blessing. Thank you for being here, and I hope the future will keep bringing us together for more joyful, successful, and peaceful days ahead.

To my Moroccan friends

ANNAB CHAIMA, I want to express my gratitude for the laughter and joy you brought into the past few years of our medical journey. Your support and companionship provided an escape from the stressful chaos of our environment. Let's continue supporting each other in the future. I wish you all the best ahead.

EL MODAFAR Kaoutar, you've been a childhood friend and a pillar of kindness. Thank you for the hours we spent together before exams, making memories and supporting each other through it all.

AIT LAACHIR Yahya, your presence and willingness to help whenever I asked meant a lot. Thank you for just being you.

E.G ILIASS, my military friend, thank you for the memories we've shared. Here's to trading them for even better ones, and thank you for your unwavering support. You're truly one of a kind..

BOUTAFSOUT OUMAIMA, thank you for sharing my passion for reading books and exchanging thoughts about them. Our brief conversations about the books we've read have been truly enjoyable.

LIAMANI Abdellah, I appreciate the book you gifted me. Our shared love for reading brought us together in friendship. As fellow empaths, I wish you all the best.

To my friends who accompanied me during the medical training, thank you for making it a more bearable experience. We all know how challenging it was for our mental health, but we persevered. I want to mention and thank each of you: ABOUCHOUKER ISMAIL, NADIA ALIOUAT, AMIMI NOUHAILA, BABA OUSSAMA, AYOUB EL GHZALI, BELEKZIZ Salma and many others. Your support has meant the world to me.

To my foreigner friends

ANTOLIVIO MONTEIRO, perhaps you won't understand this directly, but I'll translate it for you in French. Thank you for your kind heart and unwavering support; you possess a beautiful soul. My wish for you is to become one of the finest critical care doctors in the world.

Patrick Neza , I vividly recall our encounter in the neurosurgical department and the opportunity to work alongside you. I am sincerely grateful for it. Thank you for everything you've accomplished thus far. My prayers are with you as you pursue excellence in becoming the best neurosurgeon, and I wish you the peace of mind and heart you deserve.

AMEGAVI KOMI DAVID, my dearest friend, I want to express my heartfelt gratitude for being my sounding board, my free psychologist, and therapist whenever I needed you. Your unwavering support means the world to me. Thank you also for considering me when you embarked on one of the projects you were passionate about. I hope our LIASA endeavor grows into something magnificent in the future.

KOMI DAKE FLORENT, my stubborn friend, our shared tenacity has brought us closer together. Thank you for everything and for your companionship. I wish you all the best.

To all my friends whom I haven't mentioned, I sincerely apologize as the list is quite lengthy. I want to express my gratitude to each and every one of you.

To all those kind souls I've had the privilege of meeting

I would like to express my heartfelt gratitude to all my professors, from kindergarten to senior year of high school, and medical school for their contributions to my education. Each one of them played a vital role in shaping my academic journey.

To all the strangers I encountered, whether at the hospital or elsewhere, who brightened my days with their kind words and advice, your impact on me has not been forgotten. I still recall the reassuring voice of a parking lot guard at the military hospital, telling me that all those years of hard work would pay off someday. Indeed, they did!

I extend my thanks to all the doctors and professionals who provided me with opportunities to grow in my career and generously shared their knowledge with me. Your guidance and support have been invaluable. Thank you!

To the ICU survivors and mental health warriors

And finally, I dedicate this work to all those who have survived the ICU experience, those brave souls who were courageous enough to endure suffering and navigate life after their discharge from the ICU. They fought with resilience and hope, clinging to life's thread, seeking meaning, a path, and a light for a better tomorrow. They struggled to rediscover the essence of life and tirelessly worked to reintegrate into society. To those seeking order amidst chaos, to every individual battling mental illness and rising above the weight of their burdens, I salute you as warriors. Let us never forget the victims of suicide, whether they were colleagues or strangers. I genuinely hope and pray for all who have lived or are still living in the shadows of an unhealthy mind or soul to find healing and continue on the path to recovery. Mental health has always been, and will always be, a matter of great concern to me. I believe in the holistic approach of medical practice, and my profound respect goes out to all mentioned above, as well as to those who have chosen to learn and practice the art of listening and healing the spirit, allowing it to flow once more amidst the chaos—psychologists and psychiatrists alike. Special thanks also extend to the ICU doctors and staff , we acknowledge the immense mental and physical energy and personal sacrifices required in such profession and environment.And to all the brave souls who have chosen the medical field, know that our path has never been an easy one..

ACKNOWLEDGEMENTS

Professor ZARROUKI YOUSSEF

Thank you, professor, for the invaluable time, kindness, and effort you've dedicated to this work. I am deeply grateful to you for accepting me and this project from the very beginning when it was assigned to you. Your approachability and friendliness made our interactions simple, less stressful, and more enjoyable. Thank you for always being willing to help whenever I sought your assistance. Your friendly and precious advices throughout this time has been truly appreciated. Thank you.

Professor YOUNOUS SAID

Thank you professor for honoring me and agreeing to be a part of this project.Thank you for accepting to preside over my thesis .Please accept my heartfelt gratitude.

Professor REBAHI HOUSSAM

I remember my time in the obstetric ICU during my training it was a unique experience, not that pleasant, but incredibly educational and somehow a beautiful memory. I recall returning to you afterwards, and you welcomed me with a warm and open heart. Thank you for guiding me through that challenging period, for connecting me with my current advisor, and for always being there to offer support and assistance. Your kindness and generosity have meant a lot to me. As our obstetric critical care professor, your presence is invaluable to all of us your students , and we are truly grateful for your dedication. Your friendliness and hospitality are deeply appreciated. Thank you for everything.

Professor MAHMOUD AMINE LAFFINTI

The few occasions I had the opportunity to approach you for signing papers or involving you in this work were unexpectedly pleasant and comforting. Your kindness, hospitality, and genuine concern, asking if I had waited long in the reception area and ensuring everything went smoothly with the signature, were gestures that I deeply appreciated. Along with the warm hospitality of your staff, these small gentle acts had a meaningful impact on me. Thank you for graciously signing the papers when asked; it felt more like a genuine act of kindness rather than just a random signature. I'm grateful for your willingness to help, and for accepting being one of the judges, thank you.

Professor MOHAMED KHALLOUKI

I would like to express my gratitude for the honor of your presence. Your warm and kind hospitality was deeply appreciated. Thank you again for graciously accepting to be one of the judges.

To everyone who contributed in the making of this work

A heartfelt gratitude to Dr. Aemal AKHTAR for furnishing me with the Arabic translated version of the WHODAS2.0 12 items.
Special thanks to the statistical center of the Mohammed VI teaching university hospital especially Dr. Ouassim ELMANSOURI.

FIGURES & TABLES

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ABBREVIATIONS

List of abbreviations

APA : American Psychological Association
ARDS : Acute respiratory distress syndrome
CI : Confidence interval
DSM5 : Diagnostic statistical manual of mental disorder 5th edition
EN : Enteral Nutrition
GAF : Global Assessment of Functioning
HRQol : Health-related quality of life
ICU : Intensive care unit
ICU-AW : Intensive care unit acquired weakness
IQR : Interquartile range
IV : Intravenous therapy
NIV : Non invasive ventilation
No-PICS : No post intensive care syndrome
NSE : Neuron Specific Enolase
OR : Odds ratio
PICS : Post Intensive Care Syndrome
PTSD : Post traumatic stress disorder
SCCM : society of critical care medicine
WHO : World health organization
WHODAS2.0 : World health organization disability assessment schedule 2.0

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INTRODUCTION

For decades the intensive care was predominantly concerned about getting the patients to survive their critical illnesses. In a brief period the critical care medicine has experienced rapid advancements in medical equipments, such as the evolution of ventilators and various monitoring techniques, these advancements have significantly reduced mortality rates in the Intensive Care Units .However a major issue has emerged: many ICU survivors suffer from long-term impairments that impact their overall quality of life.

Historically ,there was a limited presence of discussions over the past decades concerning the long-term outcomes of survivors who underwent intensive care. Still this was about to change. The united name of all long-term cognitive, psychological and physical impairments that may appear or may persist after an ICU stay is presently known as Post-Intensive Care Syndrome (PICS).

The concept of Post-Intensive Care Syndrome has evolved over time, highlighting specific medical conditions that manifest after patients are discharged from the ICU.The precise origin of the term “PICS” is unclear, but it is noteworthy that the term has gained a widespread acceptance by the global ICU community, as a range of health issues that remain beyond the acute phase of critical illness, often starting in the ICU and persisting after the patient returns home.

“PICS” implies a wide spectrum of effects, encompassing cognitive, psychological, emotional and physical aspects. These effects may also impact the survivor’s family .In Morocco, the focus on post-ICU care is in the process of development, and this aspect of healthcare requires additional attention.

Given that managing death is not the predominant focus of critical care medicine anymore, the witnessed changes in survivors ‘lives after leaving the ICU have elevated the significance of PICS. This has prompted increased interest in dedicated research and exploration of the PICS concept.

To holistically address a patients ‘well-being and achieve optimal healing, treatments should not be confined solely to the physical aspect but should also encompass the mental,

psychological, and life quality dimensions. In Morocco, the achieved reduction in the ICU mortality is noteworthy.However,few information is available about PICS in Morocco, and there is a lack of accessible data. Moreover the state of survivors after leaving our ICUs has prompted us to further explore the consequences of ICU stays.

Our study aims to acknowledge the notable challenges presented by PICS in Morocco giving its prevalence among our patients and to increase awareness among healthcare professionals. Our primary focus in on the cognitive, psychological, and emotional aspects of PICS, with a lesser emphasis on physical impairments. Furthermore, our objective is to develop strategies for both the prevention and management of Post-Intensive Care Syndrome.

PATIENTS AND METHODS

Our study aims to objectively assess the Post Intensive Care Syndrome (PICS) among our survivors and subsequently work towards preventive measures.

I. Study type and setting:

This PICS in Morocco study is an observational survey, a cross-sectional study conducted in several affiliated intensive care units located within Mohammed VI university teaching hospital of Marrakech.

The study comprises four separate ICUs, including two dedicated to surgical care, one specialized in medical care and one specifically conceived for obstetric care.

This study relied on the medical files of the ICUs survivors as its primary data source, spanning from December,1, 2022 ,to September,30, 2023.

II. Study population and eligibility criteria :

In this study we examined the medical records of survivors from various ICUs, totaling 539 files. Among them, there were 229 people who passed away,115 excluded resulting 195 files available for analysis.

The selection process involved specific inclusion and exclusion criteria that were imposed to not only ensure the validity and relevance of our study, but also these criteria were implemented to align with the World Health Organization (WHO) requirements to use its WHODAS2.0 as a tool for our study.

1. Inclusion criteria:

In our study incorporated all adult survivors, both male and female, who were initially admitted to the ICUs with diverse diagnoses and were discharged at least one month from the

ending of our study period. This included individuals who underwent artificial ventilation invasive and non-invasive ,as well as those who didn't. Moreover, we considered the survivors who received a range of treatments across surgical, medical, and obstetric ICUs.

2. Exclusion criteria:

We excluded survivors under 18 years old and certain survivors who were initially admitted with specific diagnoses, including traumatic brain injury, meningitis, brain stroke,encephalitis,subarachnoid hemorrhage, and survivors with dementia, Alzheimer's disease, and survivors who were unreachable by phone for follow-up and incompleted files.

These diagnoses were excluded due to their symptom similarity with PICS. Survivors under 18 years old were also excluded because the assessment of PICS in the pediatric population differs from that in the adults.

III. Methods:

1. Variables :

We collected data from various ICUs within the Mohammed VI Teaching University hospital, encompassing a range of demographic information such as age,sex,marital status, employment, and place of residence. In addition to demographic data, we gathered details from medical records, focusing on the use of benzodiazepines, surgical records, and the utilization of addictive substances like alcohol,tobacco,and cannabis. Other data points included the number of days spent in the ICU, the diverse treatments administered during the ICU stay, and the type of mechanical ventilation employed, whether non-invasive or invasive (intubation or tracheotomy)also its duration.

2. Measurements:

In the course of our study, we employed the WHODAS2.0 in its short version (1) as a measurement tool to assess the disability experienced by the individuals post-discharge from the ICUs. Specifically, we utilized the 12-item assessment in its Arabic version which was definitely validated (2)(3) , we translated it into Moroccan Arabic . The 12-item version which is the short version accounts for 81%of the variability observed in the 36 item version which is the full version which was included in the DSM-5 by the American psychiatric association(APA) (2021) (4) (5)

The 12-item version has been shown to be reliable and valid in assessing total disability (6) , it includes Likert-type scale questions covering a spectrum from “none” to “extreme” difficulty over the past 30 days.

The administration was conducted through phone calls interviews .The duration between the discharge and the interviews differed among the survivors , ranging from one month to ten months. Adherence to the recommendations outlines in the Manual for WHO Disability Assessment Schedule was maintained (7).

The 12-item scoring predominantly emphasized the cognitive,pshycological,and emotional aspect associated with Post-intensive Care Syndrome (PICS), with an approach of physical aspect .

The WHODAS2.0 is a questionnaire that asks about difficulties due to health conditions. Health conditions include diseases or illnesses, other health problems that may be short or long lasting, injuries, mental or emotional problems, and problems with alcohol or drugs. It is also used in our study to observe the Post Intensive Care Syndrome (PICS) among the ICU survivors. The questionnaire contains 12 questions with a 5-point scale ranging from 0 (none) to 4(extreme/cannot). To elaborate more about the scale:

- A score of 0 for each question indicates no disability
- A score of 1 indicates a mild disability
- A score of 2 suggests a moderate disability

- A score of 3 signifies a severe disability
- A score of 4 indicates an extreme disability

3. statistical analysis:

The collected data underwent statistical analysis utilizing the Microsoft Office Excel 2010 and SPSS software program and was input into the computer using Microsoft Word 2010. This analysis facilitated the presentation of statistical findings through the creation of diagrams and frequency tables, followed by the representation of their respective percentages.

4. The limitations of the study:

This study faced limitations typical of a cross-sectional one, including data quality issues due to inaccuracies and gaps. Selection bias emerged as only survivors reachable by phone were included, limiting generalizability. The sample size (129 files for analysis) may affect detecting small effects or conducting diverse subgroup analyses. The translated WHODAS2.0 introduced measurements bias through cultural adaptation. Variability in time between ICU discharge and follow-up interviews (one to ten months) could affect data consistency and outcomes. Excluding some specific diagnoses such as traumatic brain injuries, meningitides ,stroke…) may restrict the comprehension of PICS within these potentially high-risk groups. This may be especially relevant if these diagnoses are correlated with elevated occurrence of PICS.

IV. Ethical concerns:

The study was conducted with consideration for the anonymity of participants and the confidentiality of information. The participants consented to participate over the phone. And their participation was entirely voluntary. Individuals who chose not to participate were assured that they would not face any negative consequences.

RESULTS

I. Global count :

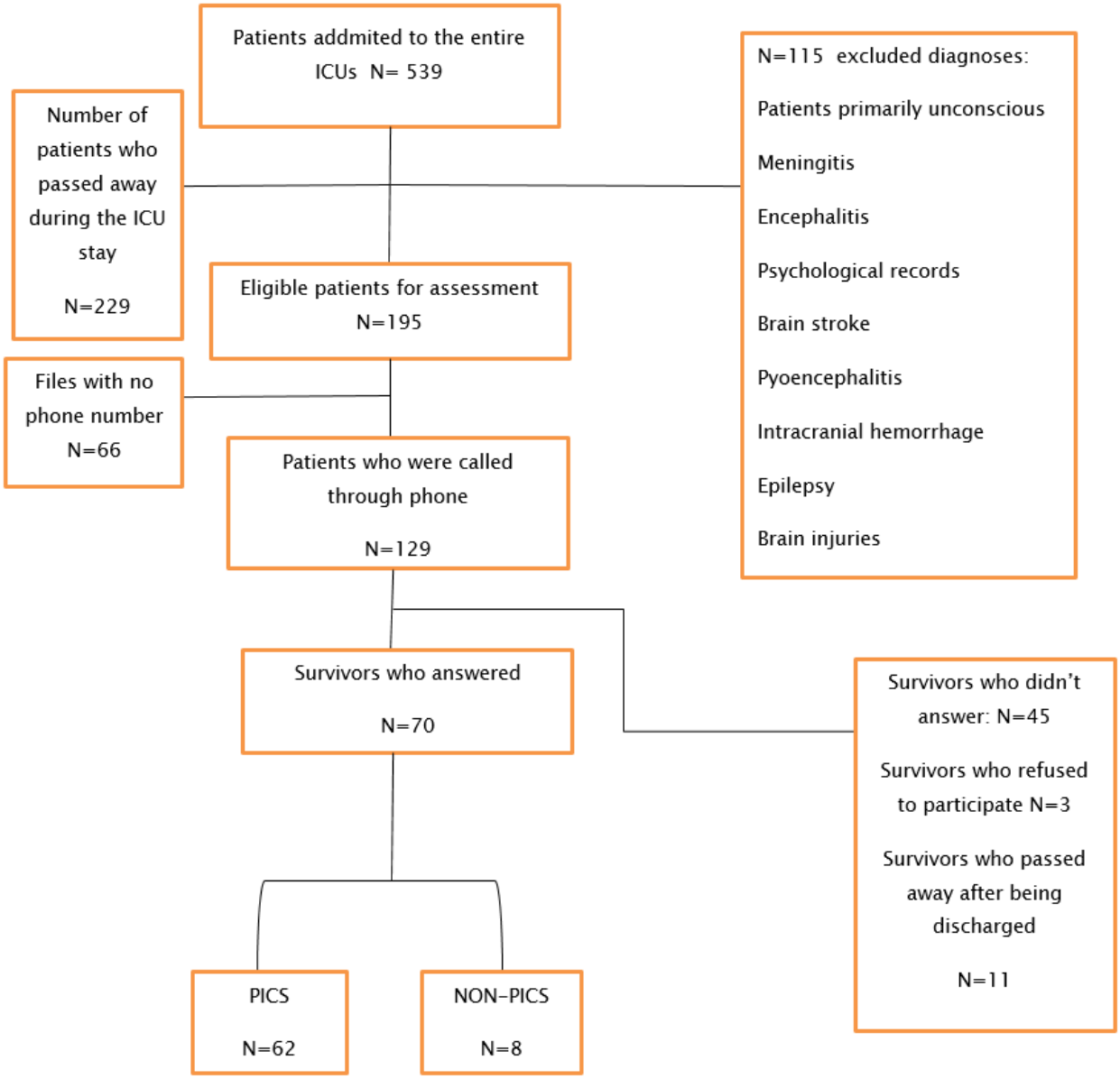

Fig1.the global count of files

From a total of approximatively 539 files investigated across different ICUs, 115 files were excluded because they had diagnoses that were part of our exclusion criteria. Among the patients, 229 passed away during their ICU stay, and an additional 11 passed away after

discharge, resulting a total death rate of 44.56%. This left us with 195 eligible files for further study. Out of these, 129 survivors were contacted, as 66 lacked phone number in their files. Unfortunately, 45 didn't answer, and 3 refused to participate. In the end, we obtained data from 70 survivors.

II. Socio-demographic data:

1. Age:

The average age in our study is 38.0, with age raging from a minimum of 18 years and 74 years .

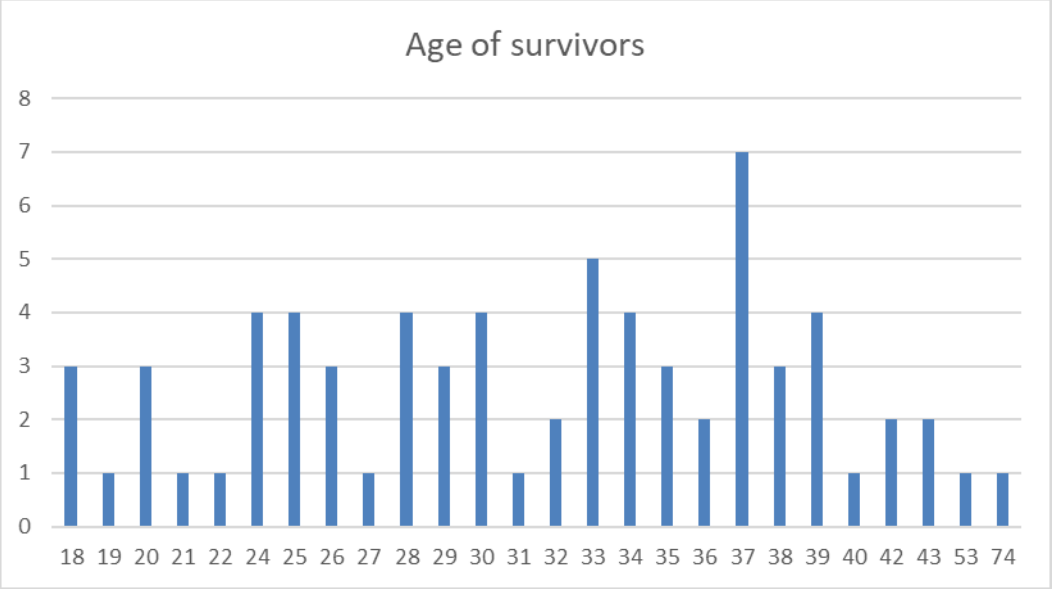

Fig2.various ages of survivors

2. Gender :

In our sample we have 3 men accounting 4% and 67 women accounting 96% of the total survivor participants. With a sex ratio of 4.48.

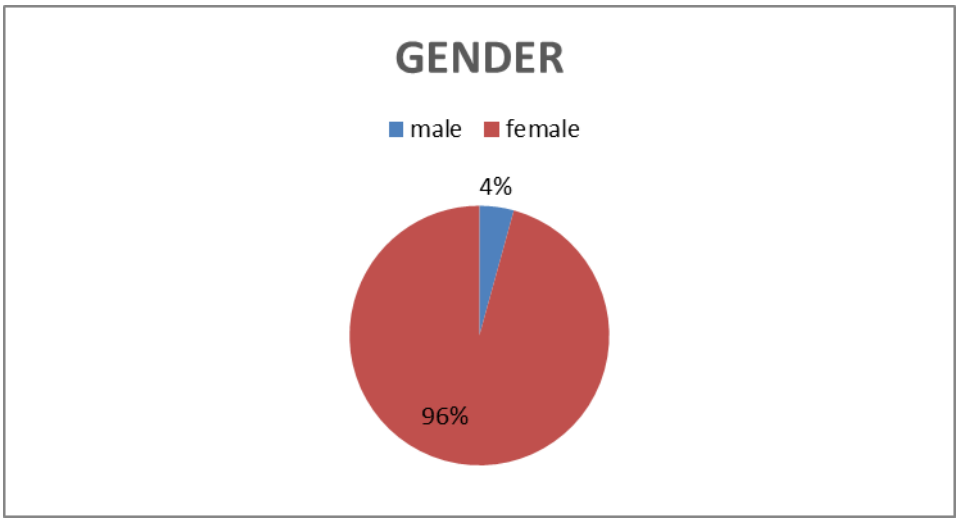

Fig3.the gender of survivors

3. Residency:

The majority of the participants reside in Marrakech: 24 which is 40% of survivors. Followed by:

Bengurir-Rhamna and Chichaoua: 5 survivors which is 8%

Zagoura and Youssoufia: 5 survivors each which is 7% each

Laayoune , Attaouia,Ait ourir and El haouz: 2 survivors each which is 3% each

Agadir,Ait immour,Beni mellal, Imintanout,Kelaa des sraghna,Saidate,Sebt ben timour,Sidi bou othmane,Tamaslouht and Sidi bou othmane : 1 survivor each which is 2% each

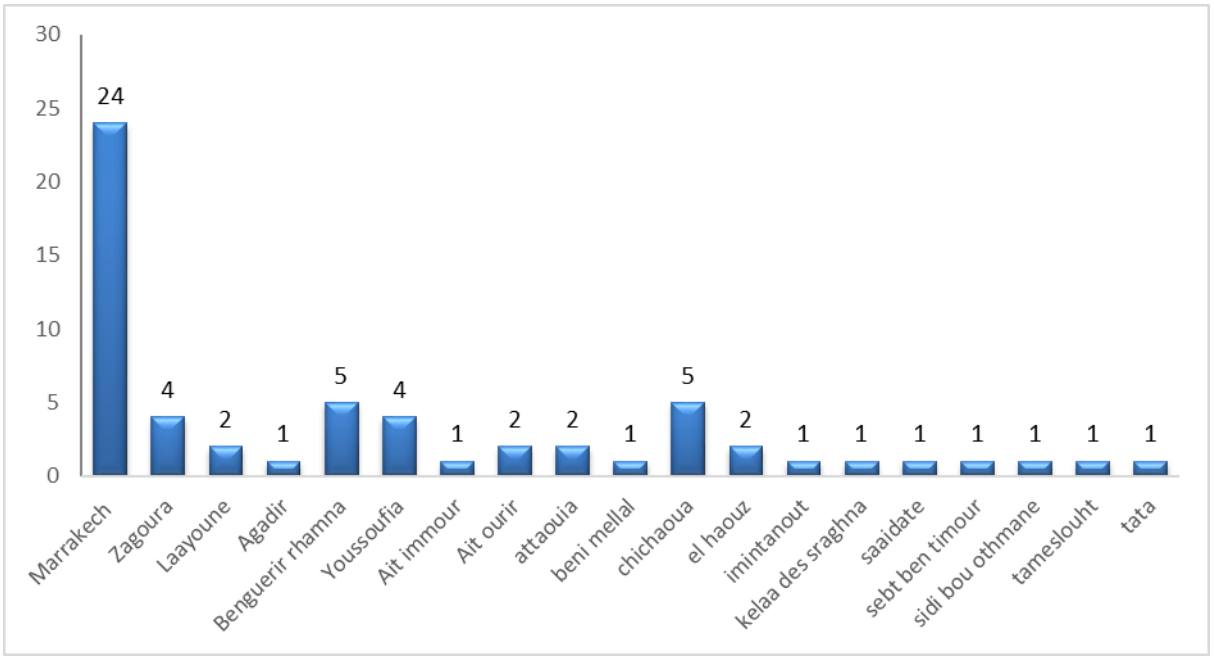

Fig4.residency of survivors

4. Jobs

In our sample there are :

1 manager constituting 1% , 2 students accounting for 3% , and finally 1 retired man with 66 housewives making 96% of participants with no jobs during the study.

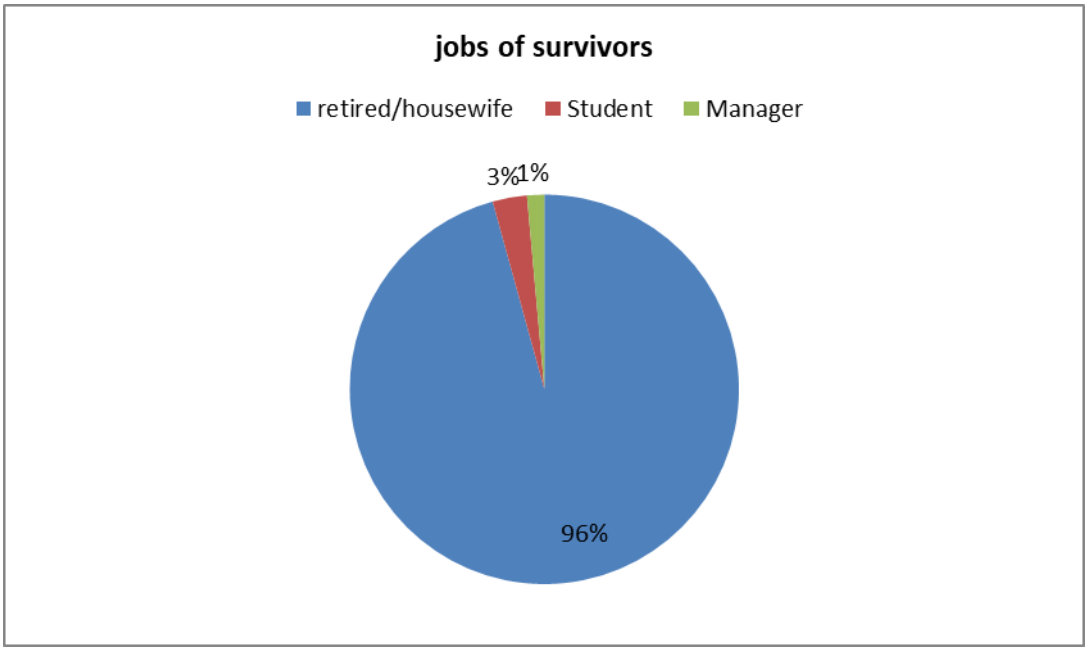

Fig5. jobs of survivors

5. Marital status:

There are 4 single survivors and 66 married one, constituting 4% and 96% respectively of the total.

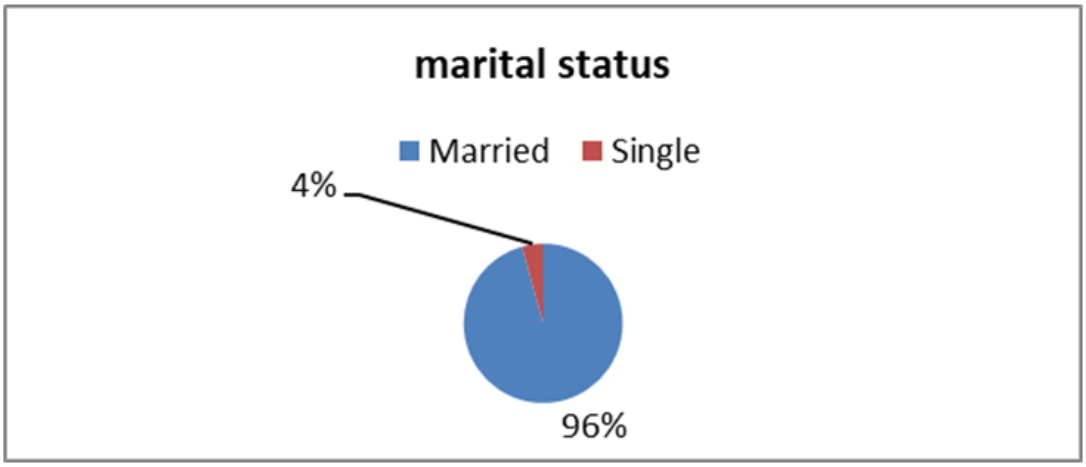

Fig6.the marital status of survivors

6. Education:

The majority of our survivors reported a low level of academic education, approximatively 57% know how to read and write, 42.85% of survivors don't know how to read or find it difficult.

Table1. Overall socio-demographic characteristics of the patients

characteristics	frequency(n=70)	Percent (%)
Age(years): Median (IQR,range)	38(36-26,74-18)	
Age(years)		
18-30	32	45.71
31-40	32	45.71
>40	6	8.5
Gender		
female	67	96
Male	3	4
Marital status		
married	66	96
single	4	4
Work status		
manager	1	1.4
student	2	2.8
housewife	66	94.2
retired	1	1.4
Education		
Academically educated	40	57
Academically not educated	30	42.85

III. ADDICTION:

In our sample only 1 survivor is reported to be addicted to tobacco, representing 1%.

The remaining 69 survivors didn't report addiction to any kind of addictive substances.

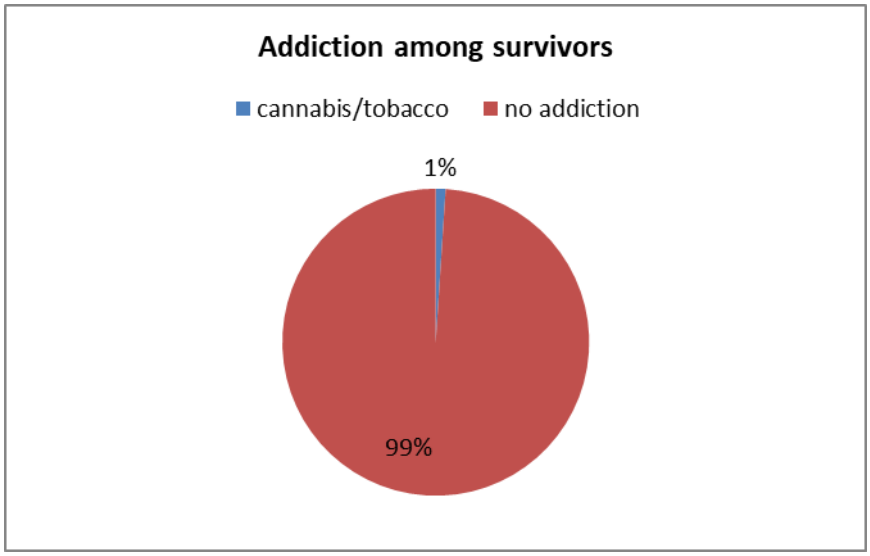

Fig7. Addiction among survivors

IV. Medical records:

The data shows that 56% of survivors are without medical records representing 45 survivors.

Hypertension and gestational diabetes are prevalent among survivors, each observed in 7 cases, accounting for 9% individually.

Type 2 diabetes represent 5% in our sample it is present among 4 survivors

3 survivors underwent a cholecystectomy representing 4%

2 survivors are reported to have chronic kidney disease representing 3%

The remaining survivors had various diagnoses in their medical records as the chart below shows

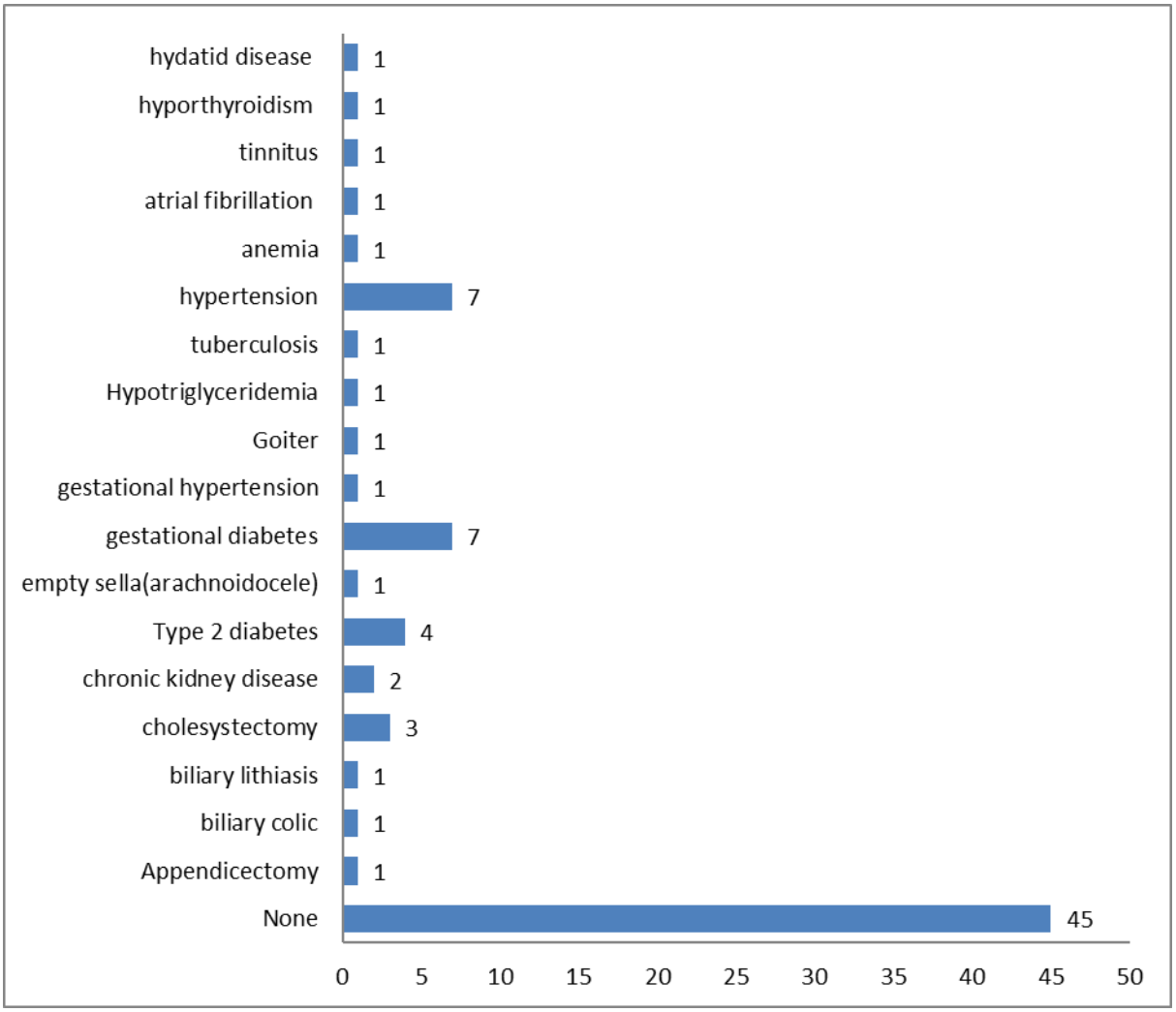

Fig8. Medical records of survivors

V. DIAGNOSES:

We observed that a significant number of the selected survivors had preeclampsia in number of 32 cases which represent 46%, primarily due to the majority being females from the obstetrical ICU.

Hyperemesis gravidarum ranked second in frequency among the observed conditions with 11 cases which is 16%.

Eclampsia was the third most common diagnosis with a total of 9 cases, representing 13%.

HELLP syndrome was fourth with a total of 5 cases, representing 7%

Respiratory failure is the fifth diagnosis among survivors with a number of 2 cases which is 3% The rest of diagnoses are 1 case for each survivor representing 1% each

Table II : the count of cases according the different diagnoses

DIAGNOSES	NUMBER OF CASES
preeclampsia	32
eclampsia	9
Carbon monoxide poisoning	1
HELLP syndrome	5
Hyperemesis gravidarum	11
Hypotriglyceridemia	1
Kidney failure	1
Megaloblastic anemia	1
Post-partum hemorrhage	1
Post-partum hematoma	1
Respiratory failure	2
Scorpion sting	1
Second degree burn	1
snakebite	1
Strangulated hernia	1
cystic echinococcosis	1

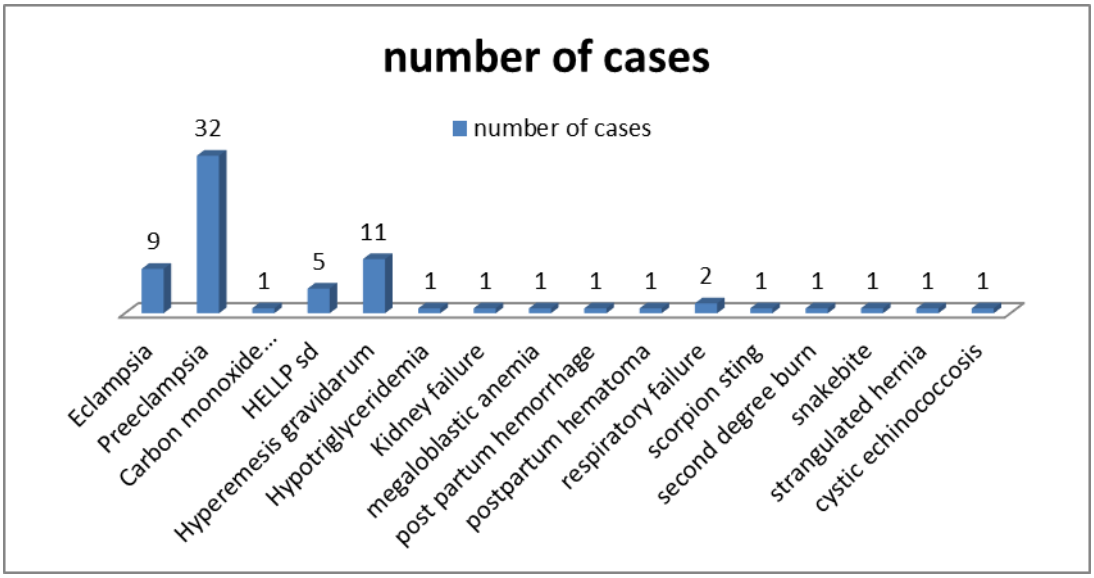

Fig9.number of cases of different diagnoses

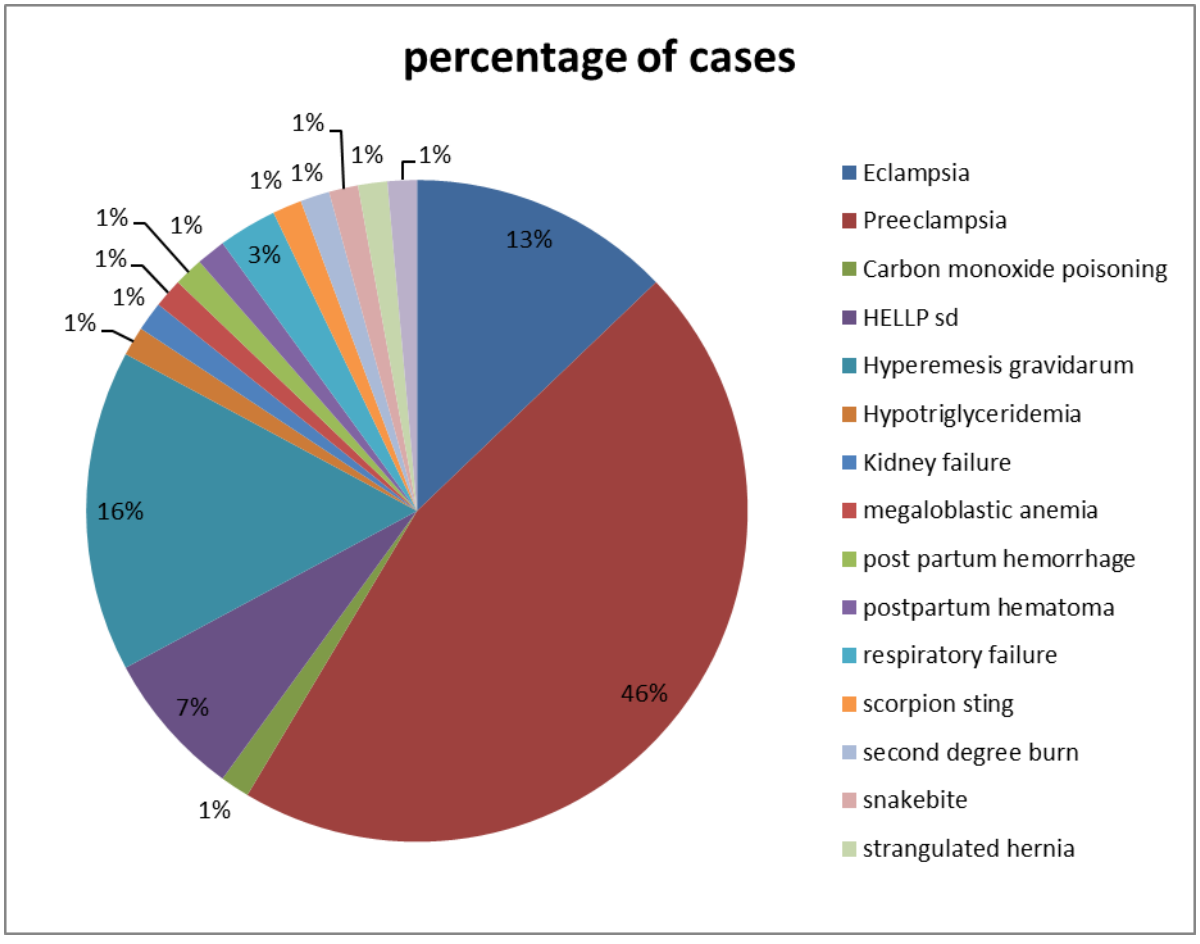

Fig10. Percentage of diagnoses

VI.Period spent in the ICUs :

In our study , the majority of survivors spent 2 days in the ICU , comprising 22 individuals . Additionally , the distribution of days spent in the ICUs is as following:

19 survivors stayed for 1 days

22 survivors stayed for 2 days in the ICU

11 survivors spent 3 days in the ICU

6 survivors spent 4days ,and another 6 spent 5days

3 survivors spent 6 days

1 survivor each spent 7 days , 8days ,and 11 days

Based on the provided data we can conclude that the median of the days spent in the ICUs is 3 days.

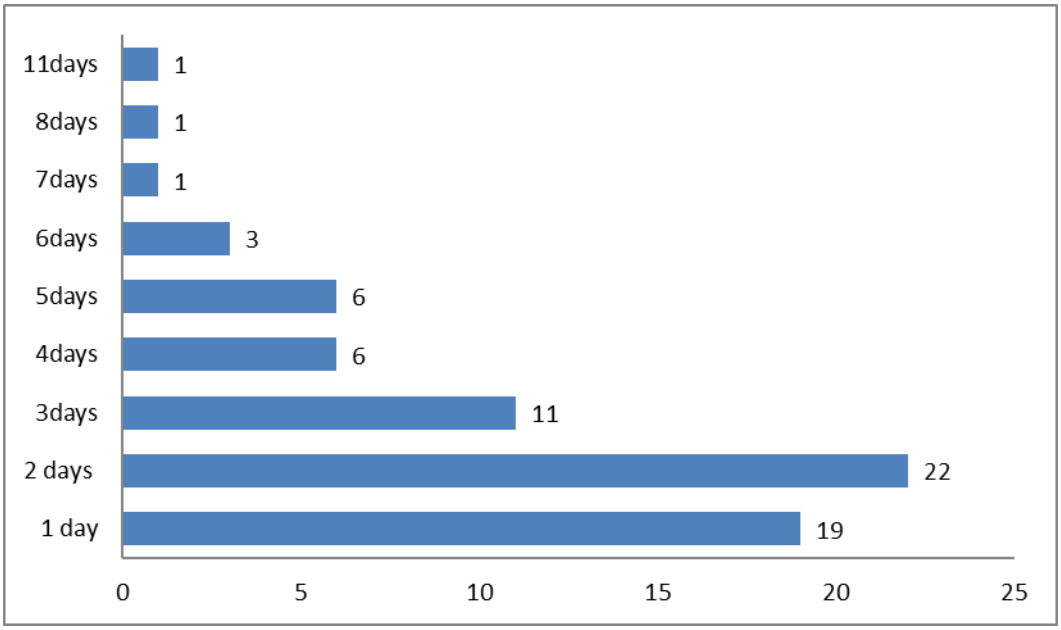

Fig11. Frequency of days spent in the ICU

VII. Mechanical ventilation:

Counting from our sample of survivors,6 individuals underwent Non-Invasive Ventilation (NIV) representing 9% , while the remaining 64 did not require ventilation representing 91%. No survivor in our sample underwent intubation or tracheotomy.

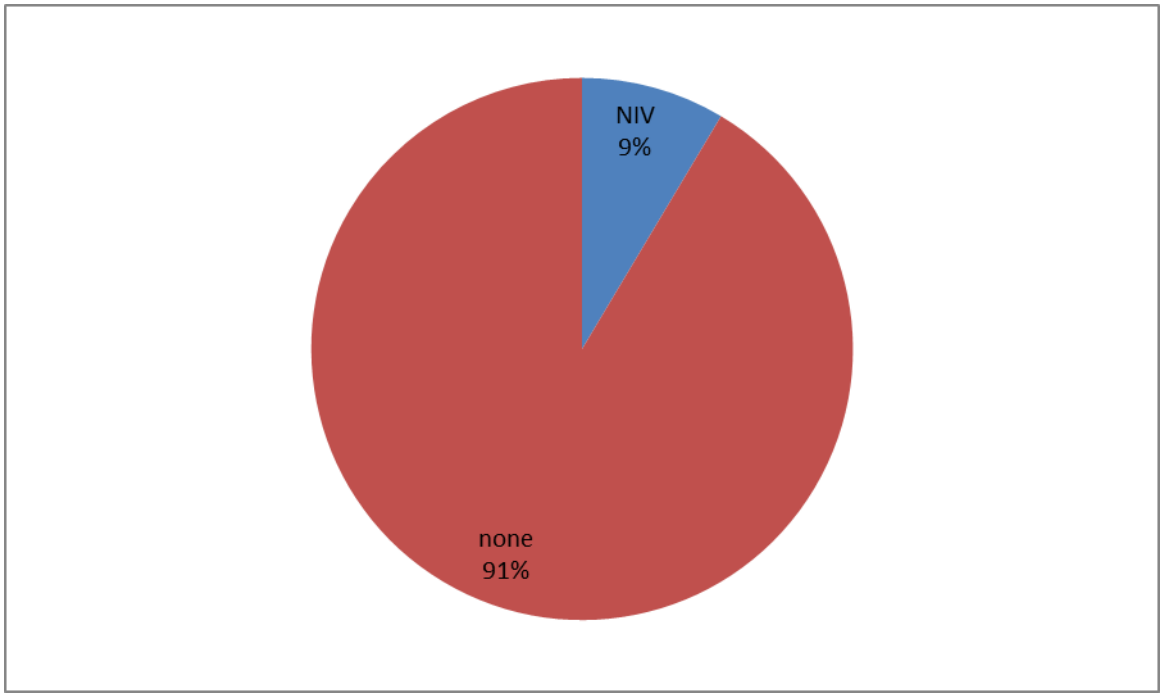

Fig12. Number of survivors who were mechanically ventilated

In our sample, six survivors underwent Non-Invasive Ventilation (NIV) with varying duration. Specifically, 1 survivor were under mechanical ventilation for 6 days ,another for 6 days ,another for 4days , 2 survivors for 3 days each ,one survivor for 2 days ,and another one for 1 day.

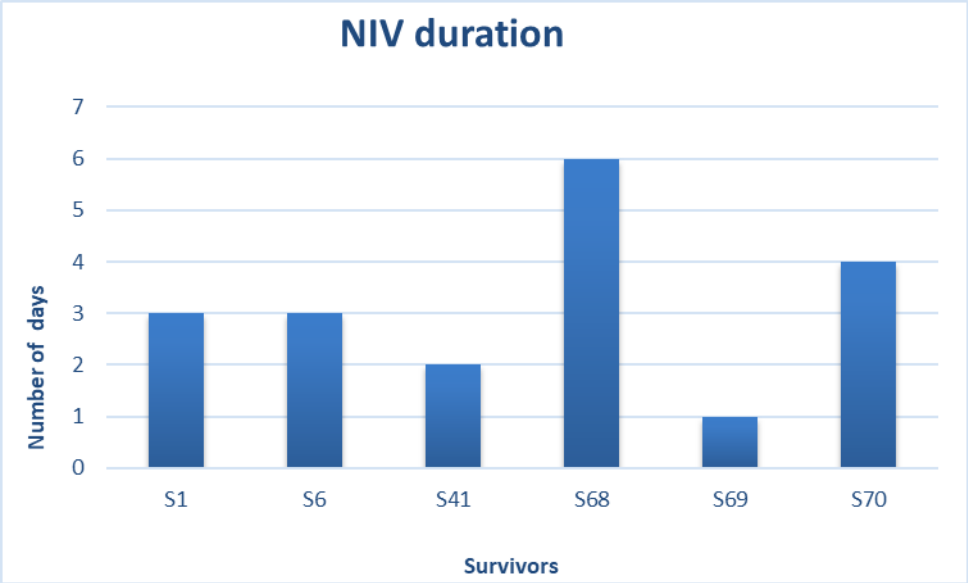

Fig13. NIV duration

Table III:duration of ICU Stay for Survivors who underwent mechanical ventilation

Ventilated patients	days spent in the ICU
S1	8days
S6	3days
S41	5days
S68	11days
S69	3days
S70	4days

VIII. Treatment:

Survivors received various treatments depending on their diagnoses .The details of these various treatments are summarized in the following table.

Table IV: treatment received by survivors during their stay in the ICUs:

Diagnoses	Treatments	Diagnoses	Treatments
Carbon monoxide poisoning	Proton pump inhibitors Enoxaparin sodium IV hydration therapy Dextrose solution and electrolytes NIV	**Strangulated hernia**	Dextrose solution+electrolytes Paracetamol+Enoxaparin sodium Proton pump inhibitros+antibiotics: 3rd generation cephalosporins/gentamicin Metronidazole+digoxin+diuretics+carvedilol Insulin+Ramipril NIV
cystic echinococcosis	IV hydration therapy Dextrose solution and electrolytes NIV	**snakebite**	Proton pump inhibitors IV rehydration therapy Serrapeptase+paracetamol antivenin
second degree burn	IV hydration therapy Dextrose solution and electrolytes+ Paracetamol+enoxaparin sodium Antiobiotics:imipenem cilastatin/ Sulfamethoxazole trimethoprim/	**Scorpion sting**	IV rehydration therapy Dobutamine+proton pump inhibitors Paracetamol+metoclopramide insulin

	Iron supplements+vitaminC Albumin NIV		
Respiratory failure 1	proton pump inhibitors+anticoagulants dextrose solution+electrolytes+ paracetamol antibiotics: 3rd generation cephalosporins/metronidazole+ beta blockers	**Respiratory failure 2**	antibiotics:3rd generation cephalosporins + beta 2 agonists+ proton pump inhibitors+ anticoagulants+dextrose solution+electrolytes Non-steroidal anti-inflammatory drug NIV
Preeclampsia	proton pump inhibitors+anticoagulants+ dextrose solution+electrolytes paracetamol+anti-hypertensive drugs magnesium sulfate antibiotics: 3rd generation cephalosporins/metronidazole / doxycycline Hydrocortisone blood transfusion NIV	**Eclampsia**	proton pump inhibitors anticoagulants+ dextrose solution and electrolytes paracetamol+ anti-hypertensive drugs +magnesium sulfate+ Corticosteroids NIV
HELLP syndrome	proton pump inhibitors+anticoagulants dextrose solution+electrolytes+ lactulose+ antiemetics+	**hyperemesis gravidarum**	proton pump inhibitors+anticoagulants+ dextrose solution+electrolytes paracetamol+ vitamines B1 B6 B12

	antibiotics:refaximin / anti-hypertensive drugs magnesium sulfate 3rd generation cephalosporins/azithromycin Diuretics lactulose betamethasone+ vitamin K antiobiotics:rifaximin		potassium + multivitamin
Hypotriglyceridemia	proton pump inhibitors+anticoagulants dextrose solution+electrolytes paracetamol+anti-hypertensive drugs magnesium sulfate	**Kidney failure**	proton pump inhibitors+anticoagulants dextrose solution+electrolytes+ paracetamol antibiotics:3rd generation cephalosporins antiemetic
Megaloblastic anemia	proton pump inhibitors+anticoagulants dextrose solution+electrolytes+ paracetamol antibiotics:gentamycin/ceftriaxone/metronidazole lactulose+ iron supplements folinic acid	**post-partum hemorrhage**	proton pump inhibitors+anticoagulants dextrose solution+electrolytes+ paracetamol+anti hypertensive drugs magnesium sulfate+ blood transfusion
Post-partum hematoma	proton pump inhibitors+anticoagulants dextrose solution+electrolytes+ paracetamol anti-hypertensive drugs+blood transfusion		

IX. The initiation time of the follow-up:

We started calling all survivors from the period of 20/10/2023 to 03/11/2023. Survivors had different periods of stay, the maximum period between the discharge from the ICU and the phone call interviews was approximatively 9 months and 20 days, while the minimum period was approximatively one month and 15 days, respecting instructions given in the WHODAS2.0 manual of administrating period of the WHODAS2.0 assessment.

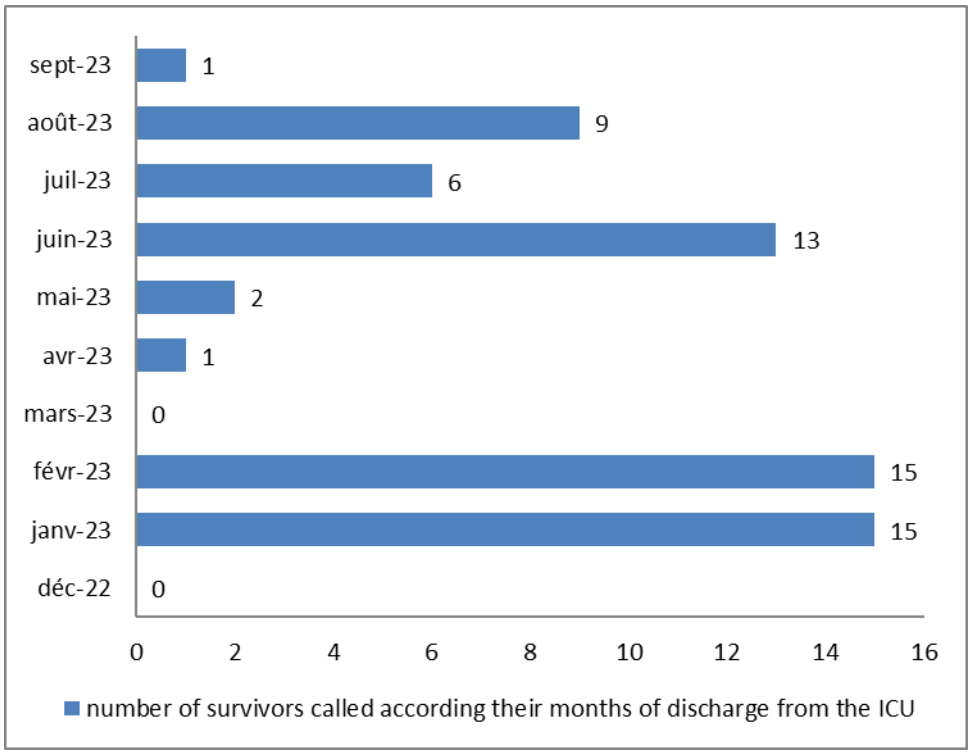

Fig14. Survivors called according the different period of discharge from the ICU

X. WHODAS2.0 score:

In our sample, it is observed that among the survivors, 62 individuals experienced the Post-Intensive Care Syndrome (PICS) constituting 89%, while 8 individuals did not, representing 11%.

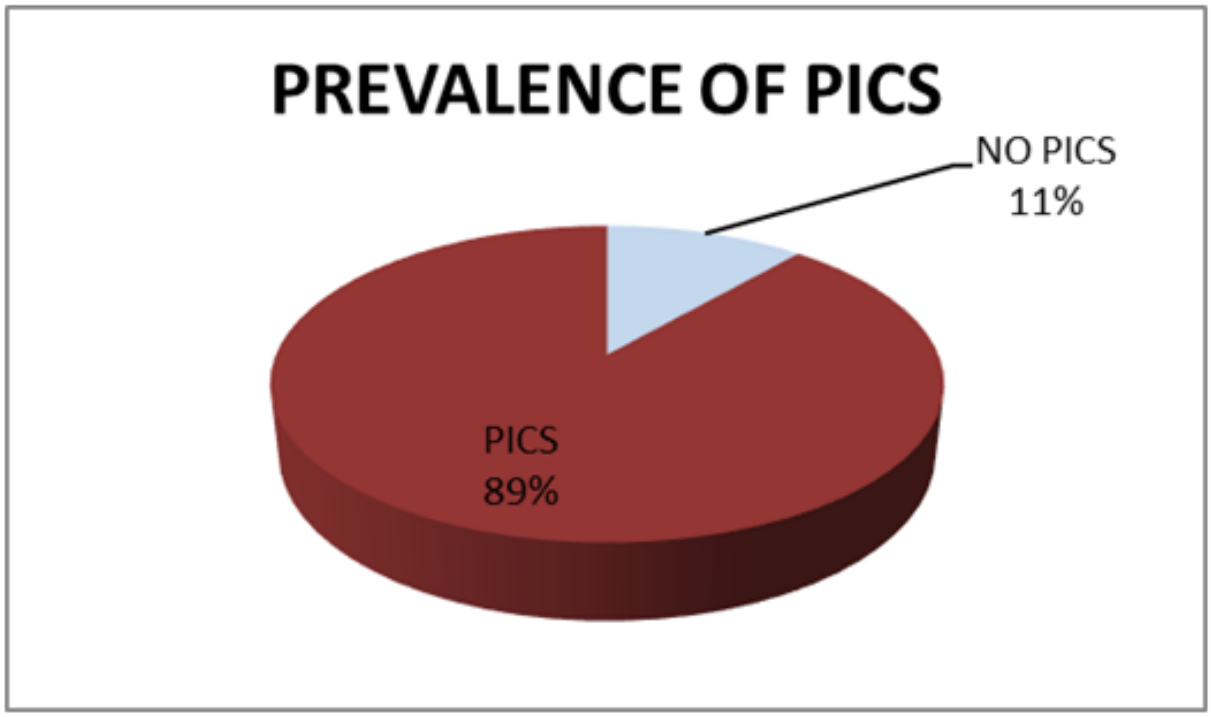

Fig15.prevalence of PICS among survivors

TableV: the average WHODAS2.0 score among survivors with PICS

The average general disability score	number of survivors
0.25	1
0.33	4
0.41	3
0.5	2
0.58	5
0.66	8
0.91	2
1.08	3
1.16	1
1.33	5
1.41	3
1.5	4
1.58	4
1.66	3
1.75	1
1.83	7
1.91	1
2	3
2.08	2
2.16	1
2.25	2
2.33	2
2.58	1
2.66	1
2.91	1

The average score among survivors is 1.41 representing a mild to moderate disability.

Table VI: WHODAS2.0 score percentile of survivors with PICS

WHODAS2.0 PERCENTILE score	number of survivors
12.50%	2
14.58%	5
16.67%	8
22.92%	2
27.08%	3
29.17%	1
33.33%	5
35.42%	3
37.50%	4
39.58%	4
41.67%	3
43.75%	1
45.83%	7
47.92%	2
50.00%	3
52.08%	2
54.17%	2
56.25%	1
58.33%	2
60.42%	1
66.67%	1

The 8 survivors who didn't present the PICS are all women from the obstetric ICU , each with a diverse durations of stay varying from 2 days to 4 days . These survivors didn't receive any mechanical ventilation and were diagnosed with preeclmapsia,eclampsia,HELLP syndrome and hypotriglyceridemia . Two of these women had documented medical records which are anemia and hypotriglyceridemia. The correspondent scores of these individuals are detailed in the table VI below:

TableVII: WHODAS2.0 scores of Non-PICS survivors

NON-PICS survivors	WHODAS2.0 average scoring	WHODAS2.0 PERCENTILE
S10	0,41	10,42%
S19	0,33	8,33%
S22	0,41	10,42%
S46	0,33	8,33%
S54	0,33	8,33%
S55	0,41	10,42%
S57	0,25	6,25%
S59	0,33	8,33%

Among 89% of survivors who exhibited PICS, and over a period that varied for each survivor , ranging from one month to 10 months after being interviewed ,30 individuals experienced it moderately, representing the highest PICS score in our sample. Additionally, 28 survivors had a mild experience, while 4 survivors experienced a severe PICS . Notably, no one in our sample demonstrated an extreme case of PICS.

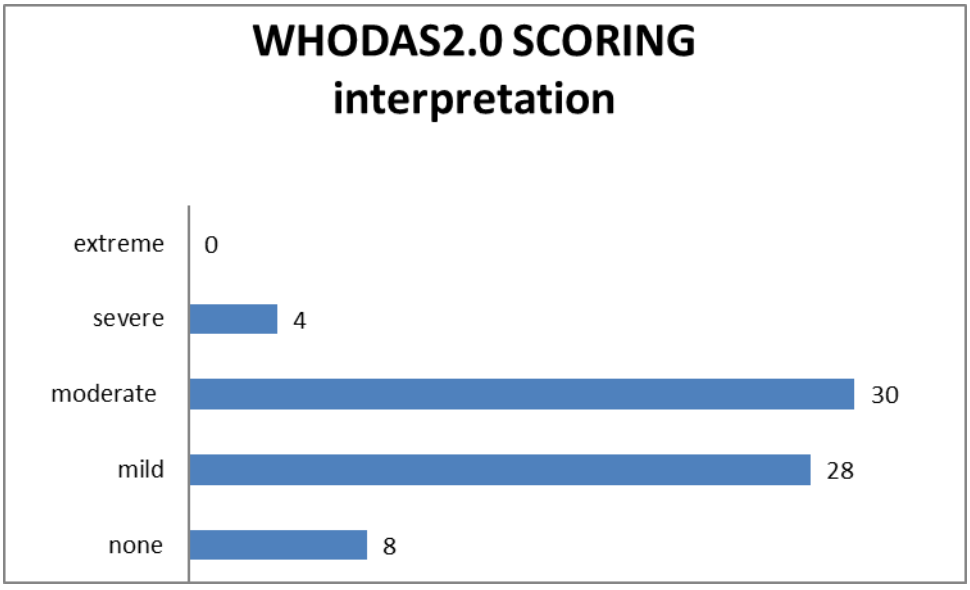

Fig16.WHODAS2.0 scoring interpretation among survivors

As it is integrated into the WHODAS2.0 score and to better understand to challenges associated with PICS, in general the days of difficulty varied from one survivor to another who presented this syndrome ,we observed the following:

- The difficulties presented in the WHODAS2.0 questionnaire were present for the majority of survivors ,with 25 individuals experiencing difficulties for 30 days
- 2 survivors faced these difficulties for 28 days , and 2 others for 15 days ,2 survivors for 8 days and 2 for 7 days ,4 days and 1 day.
- 10 survivors experienced them for 20 days
- 5 survivors were challenged during 10 days and 5 others during 5 days
- 3 survivors faced the difficulties during 2 days
- 1 survivor experienced the challenges during 12 days and 1 other during 3 days

On average survivors faced difficulties for 16,58 days and the median duration was 20 days

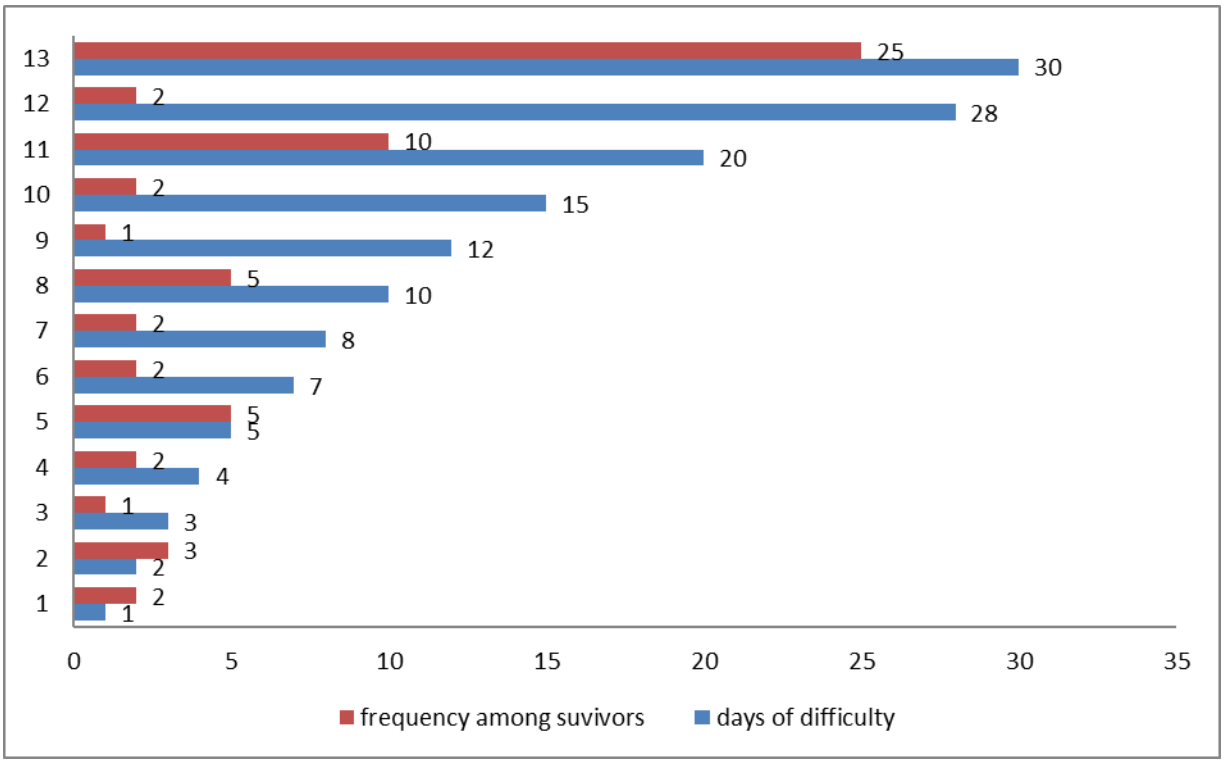

Fig17.days of difficulty of survivors

Regarding days of reduced activity listed among the questions in the WHODAS2.0 score, concerning those who presented the PICS ,the observations are as follow:

- There was 30 days of reduced activity reported among 10 survivors
- Additionally , there were 29 days of reduced activity for 1 survivor,27 days for another one,24 days for a third survivor ,and 16 days for a fourth survivor.
- 11survivors faced 20 days of reduced activity
- 2 survivors encountered one day of reduced activity , while 2 others reported 28 days of reduced activity. Additionaly,2 survivors did not experience any issues with reduced activity.
- 3 survivors face 23 days of reduced activity, while 3 others faced 3 days of reduced activity
- 4 survivors faced 15 days of reduced activity , 4 others faced 8 days of reduced activity and 4 individuals faced 5 days of reduced activity
- 5 survivors reduced their activities on 2 days , while 8 survivors reduced them for 10 days.

On average survivors reduced their activities for 14,85 days, while the median duration is 15 days .

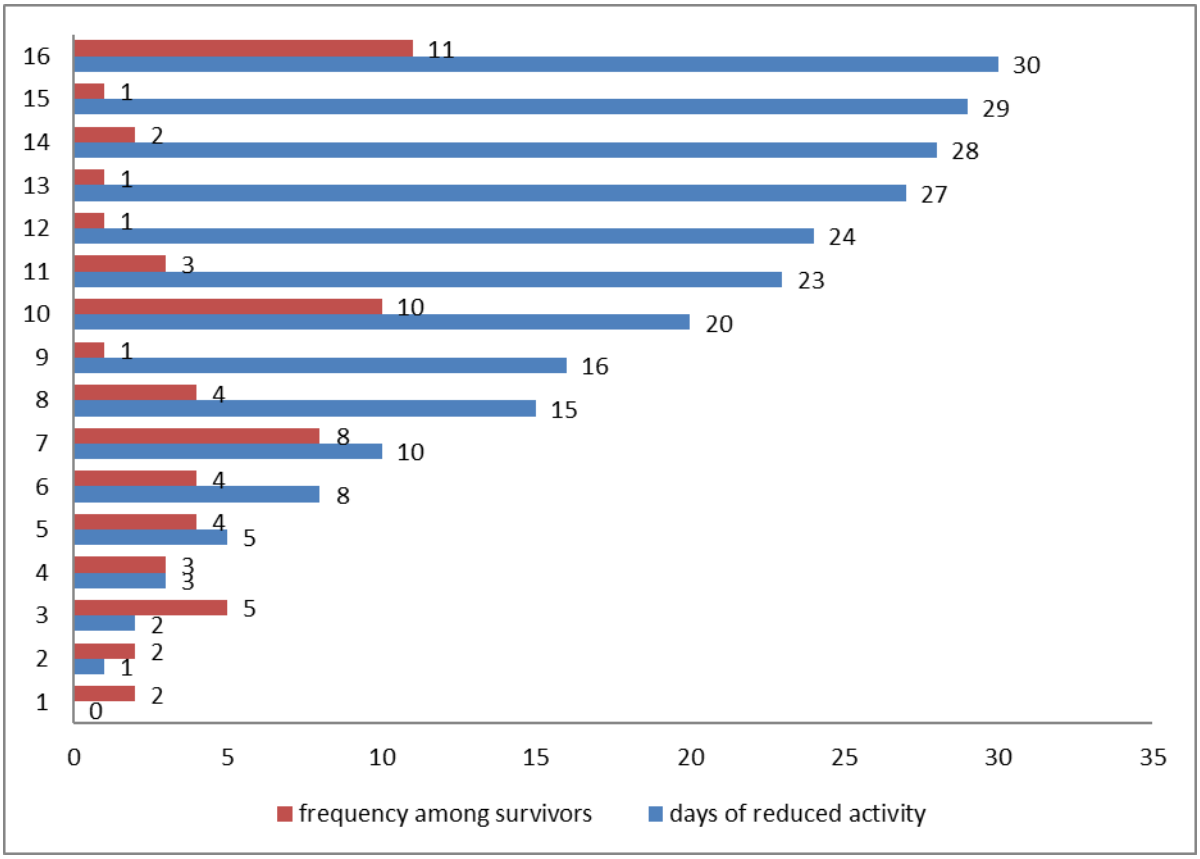

Fig18.days of reduced activity of survivors

Concerning days of totally disability we observed the following always among survivors who presented the PICS:

- 27 weren't disabled during the month they were interviewed on
- 6 survivors were disabled for 2 days, 6 others during 10 days and 6 more reported to be disabled for 20 days
- 5 survivors reported to be disabled for 7 days
- 3 survivors were disabled for 4 days
- 2 survivors reported to be disabled for 1 day and 2 others during 3 days, 2 more survivors during 5 days and 2 survivors for 15 days
- 1 survivor reported to be disabled for 6 days

On average survivors were totally disable for 1 day and the median duration is 0 days .

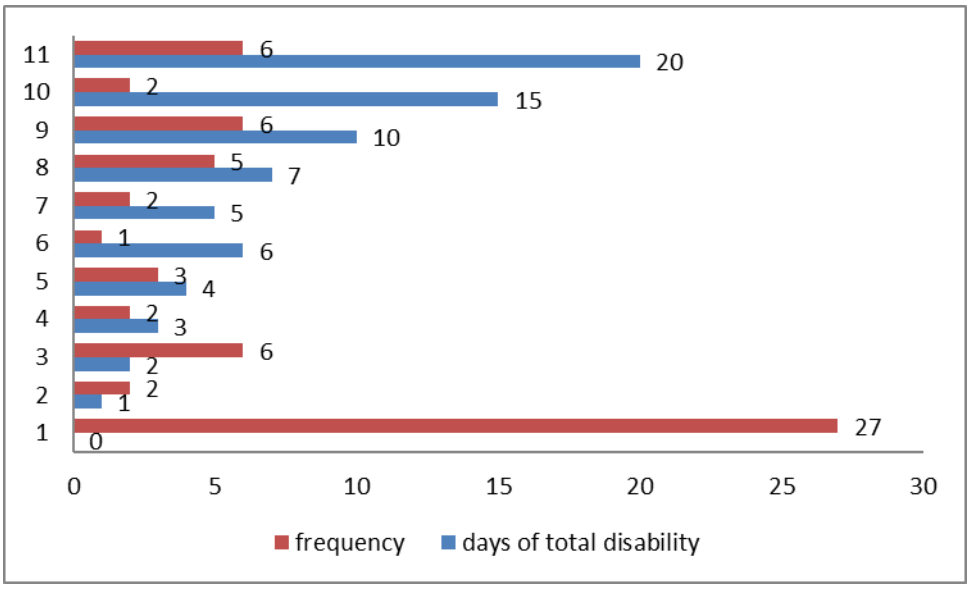

Fig19.days of total disability

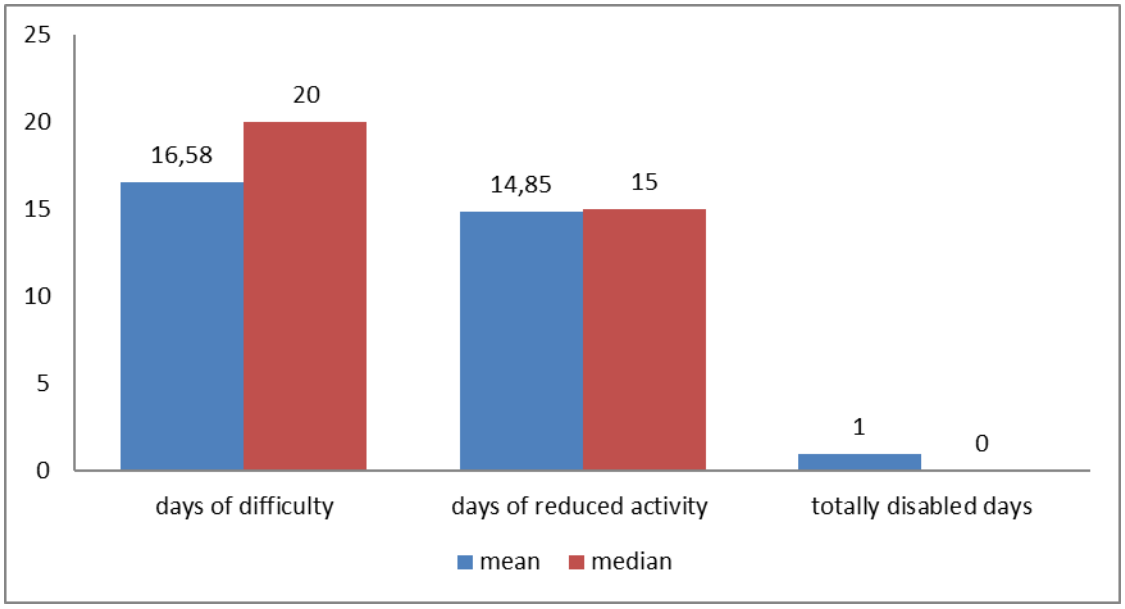

Fig20.mean and median of days

TableVIII.Disability status and number of days disability was present Average(IQR,Range)

Disability	frequency	percent(%)
PICS	62	89
No-PICS	8	11
mild	28	40
moderate	30	42.85
severe	4	5.71
Number of Days disability was present, Average (IQR, Range)		
H1	16.58(15,29)	
H2	14.85(7,20)	
H3	1(17,30)	

XI.WHODAS2.0 items:

- S1: In the past 30 days, how much difficulty did you have in standing for long periods such as 30 minutes?

In a spectrum of standing abilities among surveyed survivors, we observed varying degrees of difficulty in standing for 30 minutes. The majority faced challenges while a minority reported no difficulties at all. To be specific:

- 34 survivors encountered severe difficulty
- 14 survivors could stand for 30 minutes with a moderate difficulty
- 8 survivors managed to stand for 30 minutes with a mild difficulty
- 5 survivors found it extremely challenging or couldn't stand for 30 minutes

1 survivor didn't report any difficulty and could stand for 30 minutes

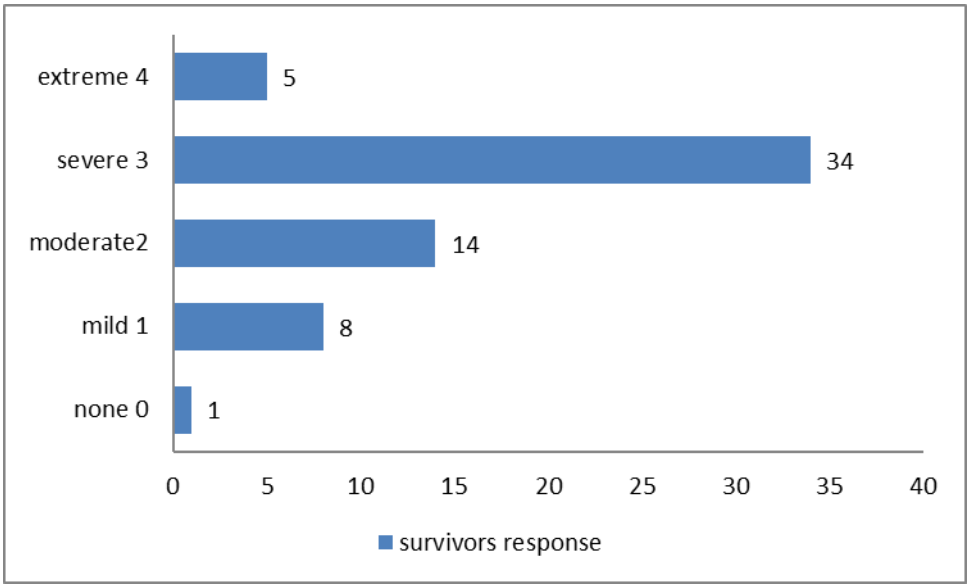

Fig21: score of 1st question of the WHODAS2.0

The average difficulty of standing for 30 minutes is 2.55 which is severe .

- S2: In the past 30 days, how much difficulty did you have in taking care of your household responsibilities?

Regarding the second question that assesses household management, we note the following observation:

- 25 survivors found it moderately difficult to take care of the household
- 15 survivors didn't report any kind of difficulties concerning the household management
- 11 survivors were mildly challenged
- 10 survivors were severely challenged with taking care of the household
- 4 survivors couldn't at all take care of their household

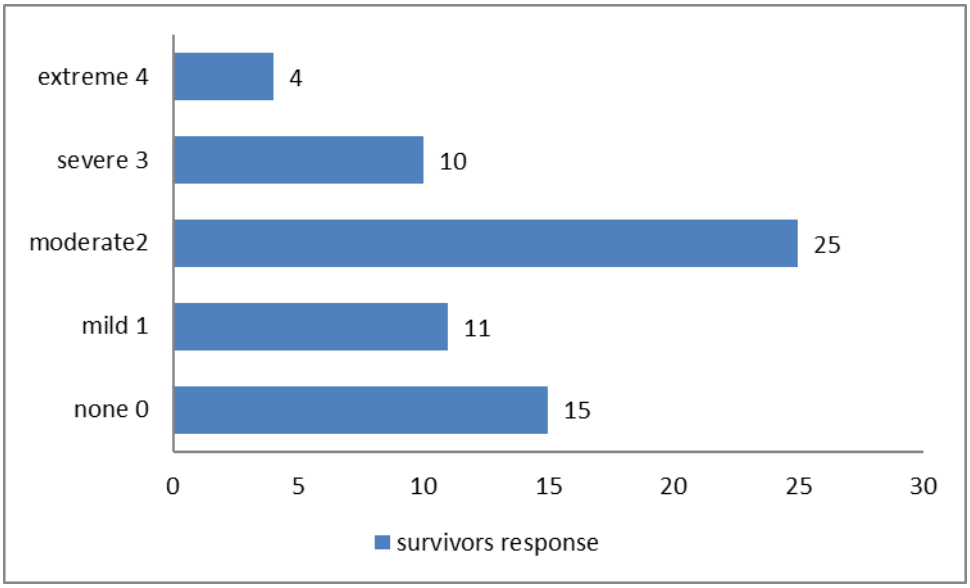

Fig22.score of the 2nd question of the WHODAS2.0

The average difficulty concerning the household care is 1.65 which is a moderate difficulty .

- S3: In the past 30 days, how much difficulty did you have in: Learning a new task, for example, learning how to get to a new place?

Regarding the 3rd question, which evaluates learning a new task we observed the following:

- 30 survivors didn't face any difficulties to learn a new task
- 16 survivors found it mildly difficult to learn a new task
- 8 survivors were severely challenged to learn a new task
- 6 survivors were moderately challenged to learn a new task
- 2 survivors couldn't learn a new task.

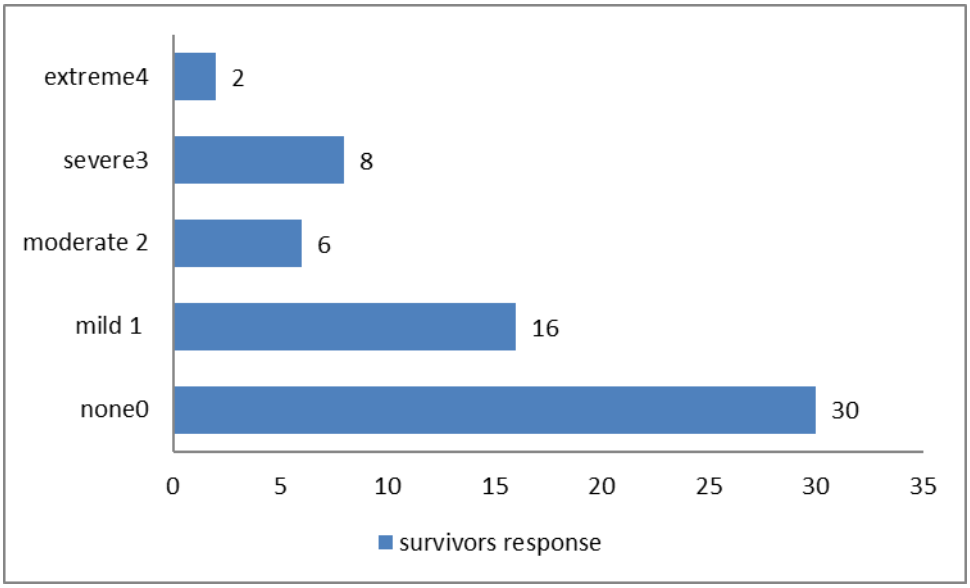

Fig23.score of the 3rd question of the WHODAS2.0

The average difficulty encountered when learning a new task is 0.93 which is a mild difficulty .

- S4: in the past 30 days, how much difficulty did you have in joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?

Regarding the 4th question which evaluates the challenge of participating in community activities similar to any healthy person, we observed the following:

- 27 survivors were totally fine with joining in community activities
- 12 survivors were moderately challenged
- 12 other survivors were severely challenged
- 9 survivors face a mild difficulty in joining in community activities
- 2 survivors couldn't join at all

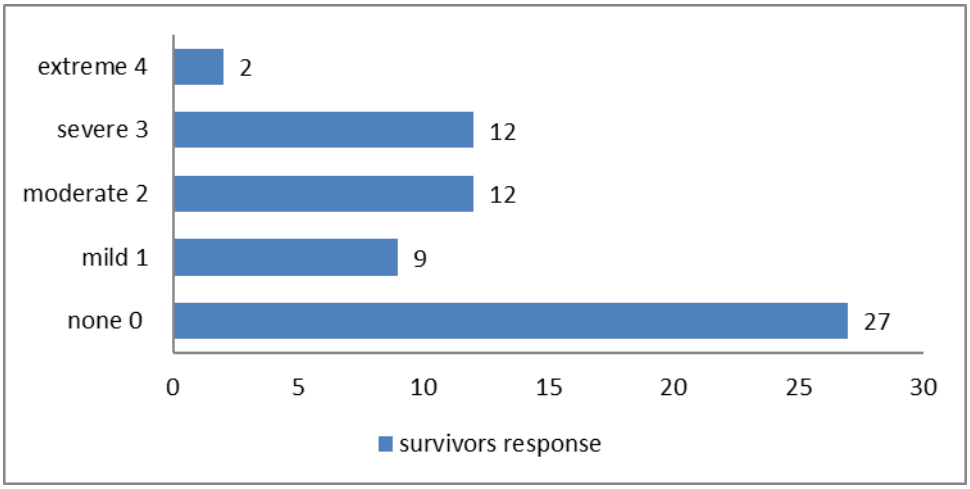

Fig24.score of the 4th question of the WHODAS2.0

The average difficulty faced in front of joining in community activities is 1,24 which represent a mild difficulty .

- S5: in the past 30 days, how much have you been emotionally affected by your health problems?

This 5th question which assesses emotional difficulties, led us to observe the following in our sample:

- 30 survivors were severely affected emotionally
- 18 survivors were moderately challenged emotionally
- 9 survivors were mildly affected emotionally
- 4 survivors were emotionally sane
- 1 survivor was extremely challenged emotionally

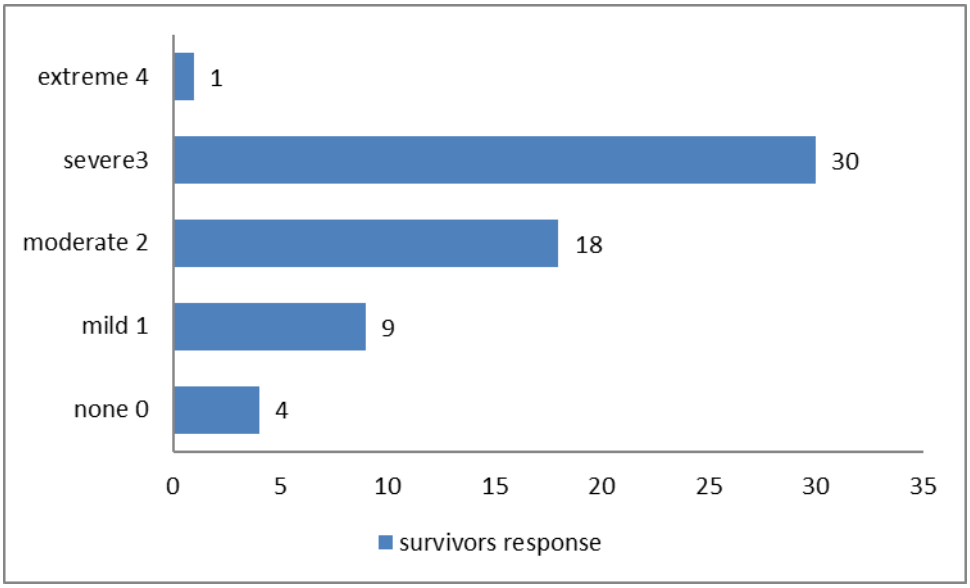

Fig25.score of the 5th question of the WHODAS2.0

The average difficulty encountered in dealing with emotional affection is 2,13 which is a moderate difficulty

- S6: In the past 30 days, how much difficulty did you have in: Concentrating on doing something for

  ten minutes?

Concerning the 6th question which assesses concentration difficulties , we observed the following:

- 25 survivors were absolutely able to stay concentrated for 10 minutes
- 21 survivors couldn't moderately stay concentrated for 10 minutes
- 13 survivors face a mild difficulty
- 3 survivors face a severe difficulty in staying concentrated for 10 minutes
- No survivor faced an extreme difficulty / couldn't do it

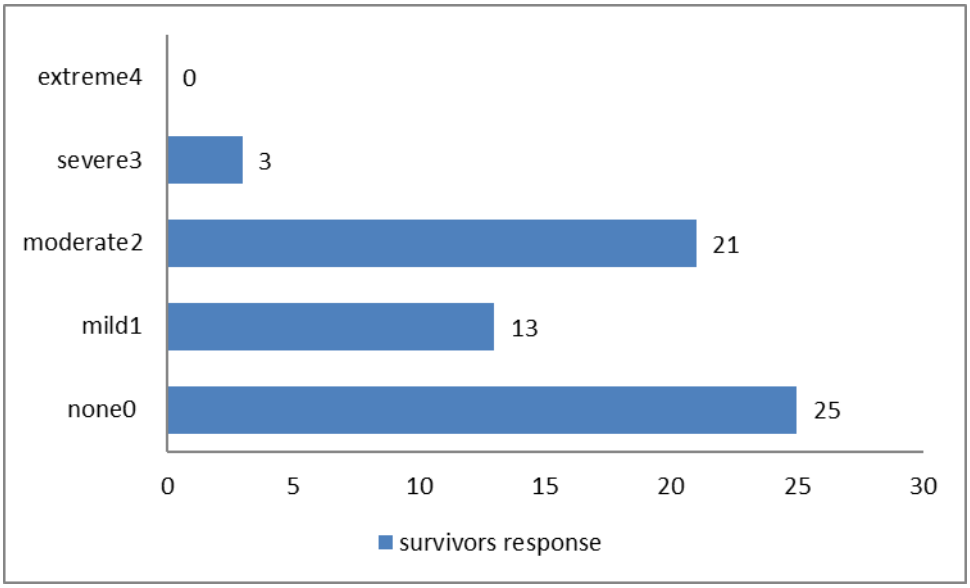

Fig26.score of the 6th question of the WHODAS2.0

The average difficulty concerning the 6th assessment is 1.03 which is a mild difficulty .

- S7:in the past 30 days, how much difficulty did you have in walking a long distance such as a

kilometer [or equivalent]?

The 7th question evaluate a physical ability which is walking a kilometer, the results are :

- 19 survivors didn't have any difficulties
- 10 survivors were mildly challenged
- 16 survivors found it moderately difficult to walk a kilometer
- 12 survivors were severely challenged
- 4 survivors couldn't do it

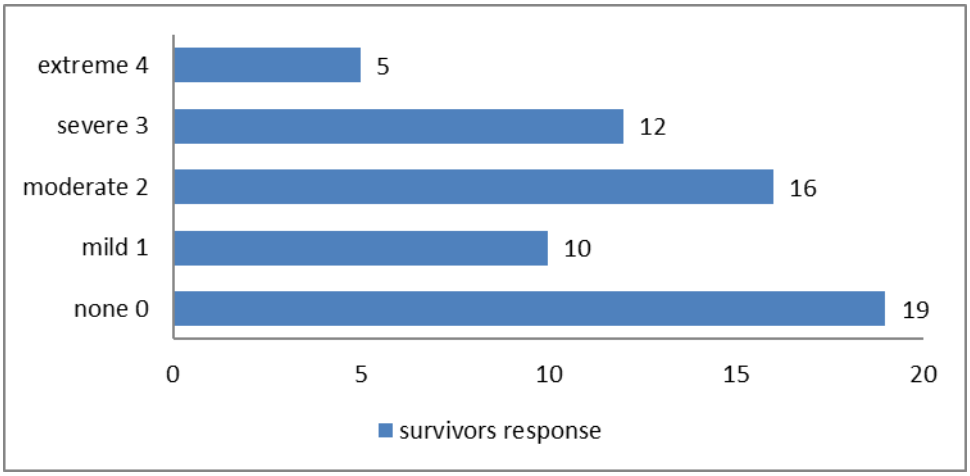

Fig27. Score of the 7th question of the WHODAS2.0

The average difficulty concerning walking a kilometer or equivalent is 1.60 which is a moderate difficulty .

- S8: in the past 30 days, how much difficulty did you find in washing your whole body?

The 8th question evaluate the physical ability to wash the whole body , the results were as following:

- 45 survivors didn't face any difficulties to wash their whole bodies
- 10 survivors were mildly challenged
- 3 survivors found it moderately difficult to wash their whole body
- 2 survivors were severely challenged
- 2 survivors couldn't wash their whole body

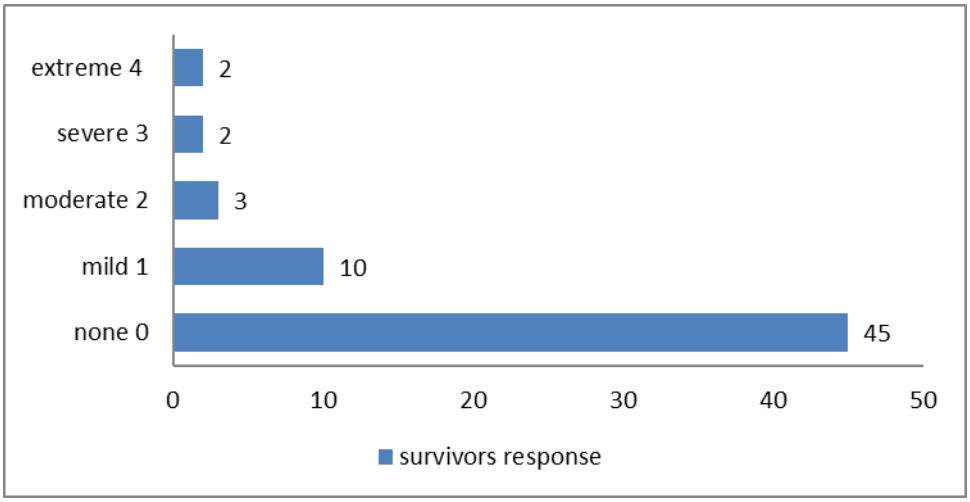

Fig28. Score of the 8th question of the WHODAS2.0

The average difficulty concerning washing the whole body is 0,48 which represent a no difficulty in the WHODAS2.0 score.

- S9: in the past 30 days how much difficulty did you find in getting dressed?

The results of the 9th question which evaluates the degree of difficulty in getting dressed are :

- 56 survivors didn't face any problems with getting dressed
- 4 survivors were mildly challenged
- 2 survivors were moderately challenged
- No survivor were severely or extremely challenged

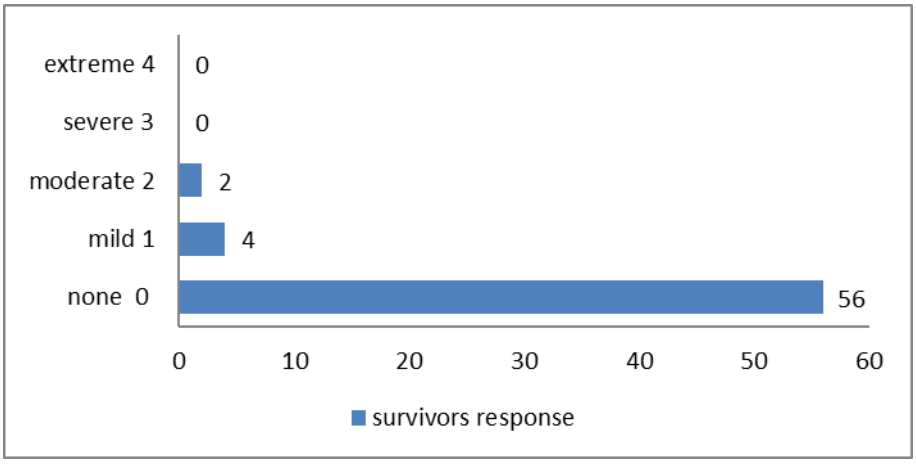

Fig29.score of the 9th question of the WHODAS2.0 score

The average difficulty in getting dressed is 0,12 which represents no difficulty

- S10: in the past 30 days how much difficulty did you find in dealing with people you do not know?

The results concerning this question which evaluates survivors ability to deal with strangers are:

- 27 survivors found it a severe task to deal with people they do not know
- 19 survivors didn't face any difficulty on this
- 14 survivors were moderately challenged
- 2 survivors were mildly challenged
- 0 survivors reported an extreme difficulty

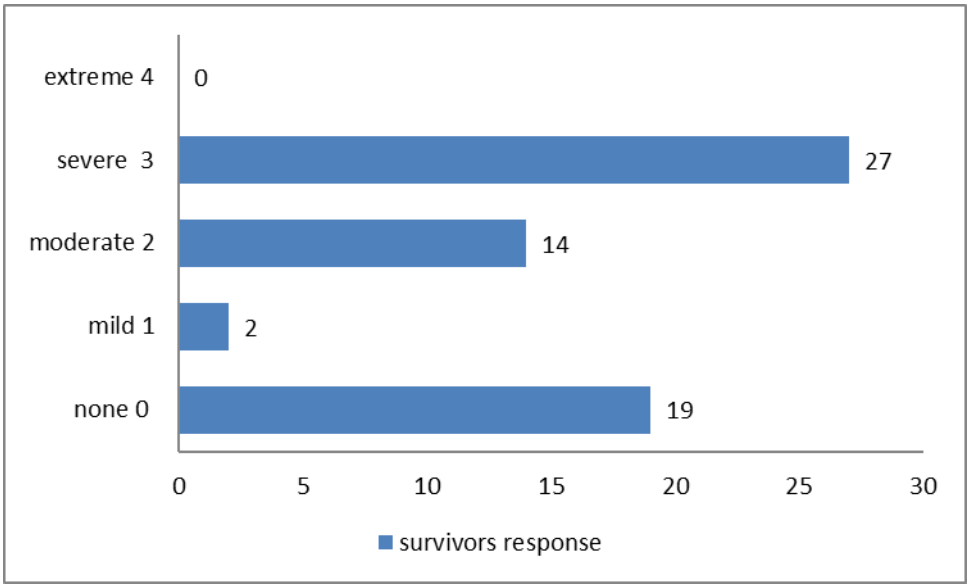

Fig30. Score of question 10 of the WHODAS2.0

The average difficulty faced in dealing with strangers is 1.79 which represent a moderate difficulty .

- S11: in the past 30 days, how much difficulty did you find in maintaining a friendship?

Concerning maintaining relationships with friends that is assessed by the question 11 of the WHODAS2.0 we observed the following results :

- 26 survivors found it severely challenging to maintain their friendships
- 18 survivors weren't challenged at all
- 10 survivors reported being moderately challenged
- 8 survivors were mildly challenged
- No survivor was extremely challenged

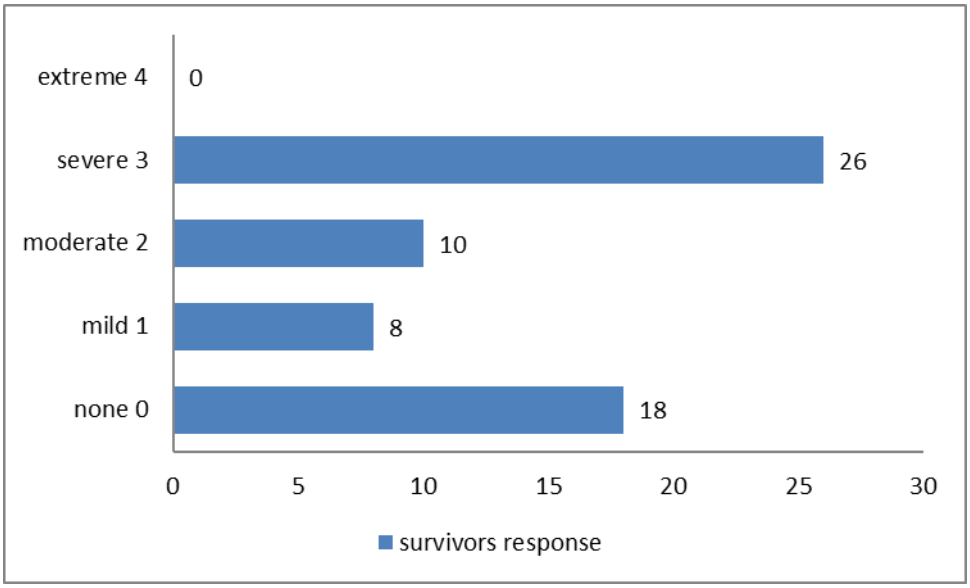

Fig31. Score of question 11 of the WHODAS2.0

The average difficulty concerning maintaining a friendship is 1.71 which is a moderate difficulty

- S12: in the past 30 days, how much difficulty did you find in your day-to-day work/school?

The results of question 12 (last one) of the WHODAS2.0 which assesses the maintain of a daily activity as before are:

- 24 survivors were moderately challenged
- 19 survivors found it severe to maintain their day to day work/school
- 10 survivors were mildly challenged
- 7 survivors didn't report any difficulty
- 2 survivors couldn't do their day to day work / school

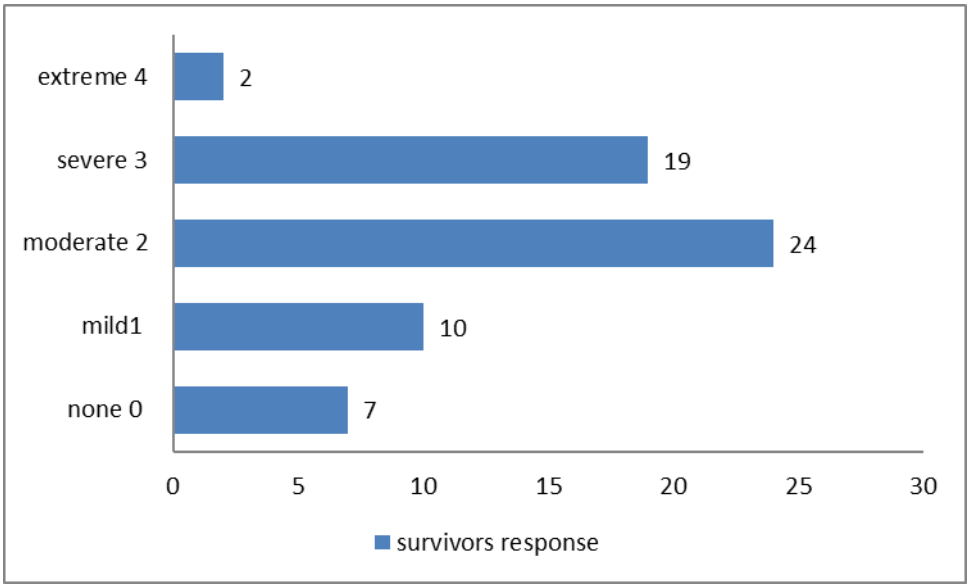

Fig32. Score of the question 12 of the WHODAS2.0

The average difficulty concerning day-to-day work/school is 1.98 which is a moderate difficulty .

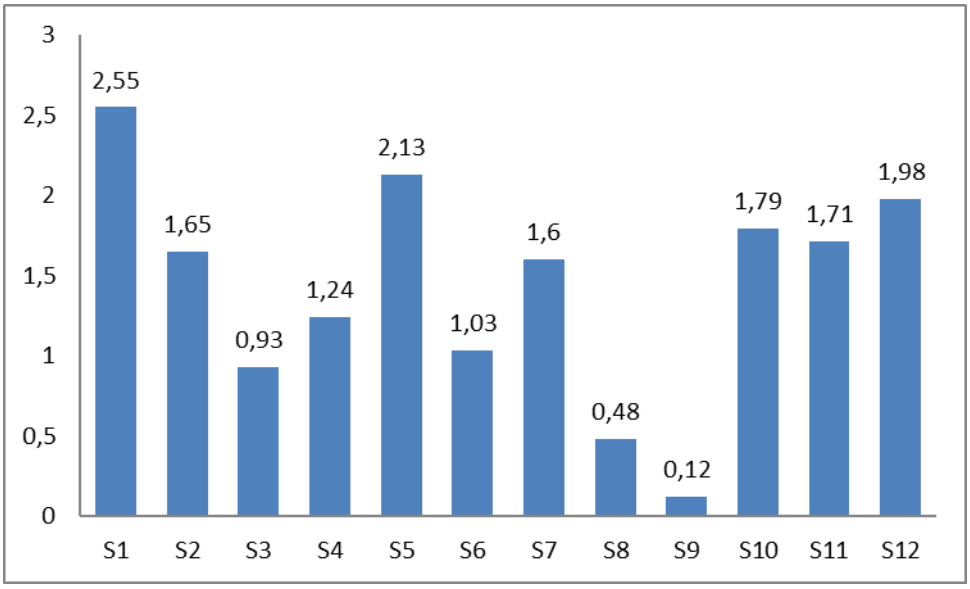

Fig33.compilation of average scores of WHODAS2.0 items

In a broad observation as the table VII below shows ,we noticed more challenges in emotional, psychological, and cognitive aspects, particularly in the areas of social interactions, daily life activities , emotional well-being , and cognitive functions. However, there were fewer reported complaints regarding physical difficulties among survivors, predominantly marked by a significant difficulty regarding S1 which is the ability the stand for a long period such as 30 minutes.

Table IX :The table below shows the 12 WHODAS 2.0 questions and how the map to each area (7).

Q	Rate your difficulty 0-4	Area
1	Standing for long periods such as 30 minutes?	mobility
2	Taking care of your household responsibilities?	life activities
3	Learning a new task, for example, learning how to get to a new place?	cognition
4	How much of a problem did you have in joining in community activities (for example, festivals, religious or other activities) in the same way as anyone else can?	participation
5	How much have you been emotionally affected by your health problems?	participation
6	Concentrating on doing something for 10 minutes?	cognition
7	Walking a long distance such as a kilometer [or equivalent]?	mobility
8	Washing your whole body?	self-care
9	Getting dressed?	self-care
10	Dealing with people you do not know?	getting along
11	Maintaining a friendship?	getting along
12	Your day-to-day work/school?	life activities

Table X: scores according different domains

Domain	WHODAS2.0 12 ITEMS	Average score	Scoring interpretation
cognitive	S6 S3	1.03 0.93	Mild Mild
mobility	S1 S7	2.55 1.60	Severe Moderate
Getting along	S10 S11	1.79 1.71	Moderate Moderate
Life activities	S2 S12	1.65 1.98	Moderate moderate
Participation/emotions	S4 S5	1.24 2.13	Mild moderate
Self-care	S8 S9	0.48 0.19	None None

The figure below shows the prevalence of PICS impairments observed in our study, presented as percentages.

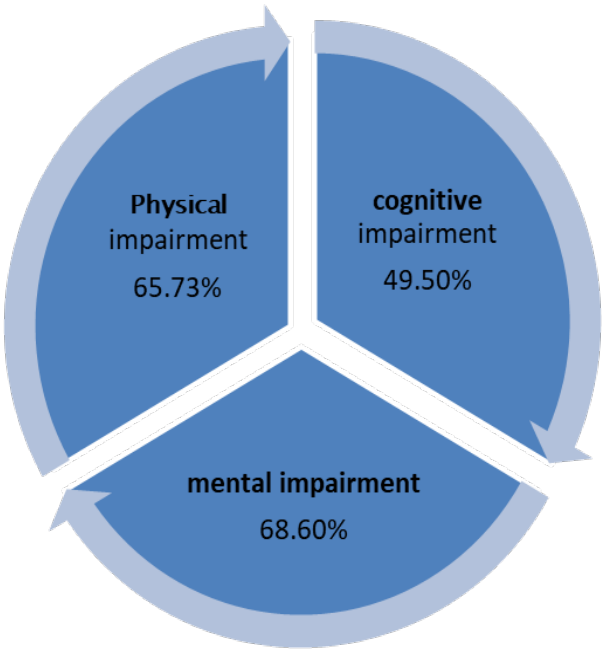

Fig34.percentages of different impairments among our sample

XII. Co-occurrence of PICS related symptoms in our sample:

As outlined previously, through the use of WHODA2.0 across various domains, we observed difficulties in two distinct areas. The first was the physical domain, evident by challenges such as standing for 30 minutes. The second domain of difficulty was participation/emotion. Additionally, difficulties were noted in day-to-day activities. This indicates that our survivors faced challenges both physically and non-physically following their discharge from the ICU,

DISCUSSION

Intensive care medicine originated in the mid-1900s,at the beginning it was survival and death. Over subsequent years , a notable transformation occurred in critical care ,particularly during the polio epidemics in Europe in the early 1950s, marked by a significant advancements in life-saving interventions(8).

In 1976, the initiation of the inaugural post-intensive care unit (ICU) outcome study marked the genesis of heightened attention to the post -ICU phase and the well-being of survivors following their discharge from the ICU . (8)

In the year 2010 , the society of Critical Care Medicine (SCCM) assembled a global multi-stakeholder consortium that coined the term of " Post-intensive care syndrome" (PICS) (8) . The conceptualization of PICS was driven by multiple key objectives including: raising awareness among clinicians, patients, families and the general public , promoting increased screening of distinct impairments arising subsequent to critical illness and fostering further investigation into specific morbidities associated with this syndrome.

Our study concentrated in this subject matter, which is a cross-sectional study with a prospective data collecting, taking as a sample survivors from the Mohammed VI university hospital, addressing mostly the psychological and cognitive impairments following a post-intensive care unit (ICU) stay.

Through our study ,our primary objective is to ease the challenges that survivors face after their stay in the ICU and to implement measures to prevent them.

I. Definitions:

The main definitions used in our study derive from various sources, we couldn't find a certain uniformity provided by the WHO.

❖ Post-Intensive Care Syndrome (PICS) is defined by the Society of Critical Care Medicine (SCCM) as a made up of health problems that remain after critical illness. They are present when the patient in the ICU and may persist after the patient returns home. These

problems can involve the patient's body, thoughts, feelings, or mind and may affect the family. PICS may show up as an easily noticed drawn-out muscle weakness, known as ICU-acquired weakness; as problems with thinking and judgment, called cognitive (brain) dysfunction; and as other mental health problems.(9)

- Cognitive impairment: as mentioned in the encyclopedia of behavioral medicine it refers to problems people have with cognitive function such as thinking, reasoning ,memory, and attention. (10)
- Psychological deficit: this impairment is defined by the American Psychological Association (APA) to be a cognitive ,behavioral, or emotional performance of any individual at a level that is significantly below, or less than the norm (11).
- Intensive care unit (ICU): An ICU is an organized system for the provision of care to critically ill patients that provides intensive and specialized medical and nursing care, an enhanced capacity for monitoring, and multiple modalities of physiologic organ support to sustain life during a period of life-threatening organ system insufficiency.(12)
- WHODAS 2.0: WHO disability assessment schedule is a practical, generic assessment instrument that can measure health and disability at population level or in clinical practice. WHODAS 2.0 captures the level of functioning in six domains of life:
  - Domain 1: Cognition – understanding and communicating
  - Domain 2: Mobility – moving and getting around
  - Domain 3: Self-care – attending to one's hygiene, dressing, eating and staying alone
  - Domain 4: Getting along – interacting with other people
  - Domain 5: Life activities – domestic responsibilities, leisure, work and school
  - Domain 6: Participation – joining in community activities, participating in society.(1)

II. Epidemiology

1. International data

Assessing the incidence of emerging or exacerbated impairments following a critical care illness , referred to as ''Post-intensive care syndrome'' can be challenging due to the limited availability of data regarding pre-ICU baseline conditions. However, numerous studies conducted across various countries examine the prevalence of impairments arising in the ICU experiences.

Highlighting the reliability , validity , and responsiveness of the 12-item WHODAS2.0 is crucial when discussing its effectiveness as a disability assessment tool for critically ill patients.(Higgins et al) (13). On the other hand it is important to mention that an American study determined that the WHODAS2.0 and IPF can effectively be a substitute for the GAF (global Assessment of functioning), to use in the PTSD disability evaluations and determinations. (14).It is now included in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5(15)).

A prospective multicenter cohort study, conducted among survivors 1 year after their ICU admission in the Netherlands , revealed notable findings. Among medical patients,58% reported new physical, mental, and /or cognitive problems 1 year after the ICU admission, while the figures were 64% for urgent surgical patients and 43% for elective surgical patients. Urgent surgical patients showed significant decline in both physical and mental functioning , whereas elective surgical patients demonstrated a notable improvement. Medical patients reported an increase in symptoms of depression. All patient groups experienced a significant decline in cognitive functioning . importantly, the study identified a strong association between pre-ICU health status and the emergences of post-ICU health problems. (Geense WW, Zegers M, Peters MAA, et al) (16)

A cross-sectional analytical study was undertaken among patients admitted to Aga khan University Hospital in Nairobi, Kenya. The assessment of disability levels utilized the WHODAS2.0 , 12 items version. The findings revealed a notable mortality rate of 46.8%. Among patients

discharged from the hospital's ICU , the disability status varied, with 28.6% exhibiting no disability , 24.2% experiencing mild disability , and 42.8% facing moderate to severe disabilities . (Khadija Ahmed, Vitalis Mung'ayi* Department of Anesthesia, Aga Khan University, Nairobi, Kenya) (17)

An observational cohort study conducted in 16 ICUs across 14 hospitals in Japan. The study used the HRQoL assessed by the SF-36 questionnaire . The study revealed that 64% of survivors front the ICUs experienced impairments associated with the PICS . Additionally , around 20% of these survivors exhibited a simultaneous occurrence of various PICS impairments. (kawaka(18) .

Another study conducted in the University of Mississippi Medical Center (USA), using the WHODAS2.0 36-items version, revealed that survivors exhibited the PICS having most difficulties in the WHODAS2.0 domains of " participation in society" and " getting around". (Mullins et al) (19) .

At the Mount Sinai Hospital in New York city (USA) in the critical care recovery clinic a single-center descriptive cohort study from April 21 to July 7/2020 taking as a study population survivors who experienced severe critical illness from coronavirus disease 2019, necessiting a stay in the ICU lasting 7 days or more, they consented to participate in a telehealth follow-up at the critical care recovery clinic 1 month after their discharge from the hospital . In this study they used the Modified Rankin Scale, Dalhousie Clinical Frailty Scale, Neuro-Quality of Life Upper Extremity and Lower Extremity Function, Neuro-Quality of Life Fatigue), psychiatric (Insomnia Severity Scale; Patient Health Questionnaire-9; and Posttraumatic Stress Disorder Checklist for Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition), and cognitive (Telephone Montreal Cognitive Assessment) domains. The 3-Level Version of Euro-QoL-5D was used to assess the physical and psychiatric domains. The outcome of this study PICS was observed in 91%(41out of 45) of patients and 87%,20%,and 49% reported physical, cognitive impairments and mental health issues respectively.(Martillo et al) (20).

In India, New Delhi a study conducted an analysis of Post-Intensive Care Syndrome (PICS) revealing that cognitive impairments affected approximatively 25% on average. Concerning psychiatric illnesses they were present on an average of 1% to 62%. In terms of physical impairments , ICU-acquired neuromuscular weakness emerged as the predominant challenge affecting over 25% of ICU survivors. (Rawal et al) (21).

In France,Paris a study was carried out revealing the existence of the Posy-Intensive Care Syndrome (PICS) among survivors of the Saint Antoine University Hospital,APHP, Sorbonne University. (Voiriot et al) (22).

In the united kingdom (UK) a study involving 293 participants showed that survivors experienced major challenges related to mobility , self-care , pain and anxiety/depression after their discharge from the ICU using the EQ-5D subscales. (Griffiths et al) (23).

In Pavia, Italy a follow up of patients after one month of their discharge showed the presence of Post Intensive Care challenges marked mostly by acute stress disorder which was present in 40% (19out of 47) after COVID-19.(Mongodi et al) (24).

MONITOR-IC study (MiCare study), a mixed methods prospective multicenter controlled cohort study assessing 5-years outcomes of ICU survivors and related healthcare costs conducted in Netherlands using the health-related quality of life (HRQoL) , this study started approximatively with 12000 ICU survivors from July 2016 to July 2021 indicated a significant prevalence of post-intensive care impairments.(Van sleeuwen et al) (25).

National Data

As previously noted, the revelation of the Post-Intensive Care Syndrome(PICS) introduced a new perspective in 2010 . However there is limited data regarding its global incidence and frequency .

Specifically in Morocco , there is a notable absence of surveys or studies that document the frequency or incidence of the PICS in our country.

III. Discussion of factors associated with Post-Intensive Care Syndrome

1. Global data

In our study , we identified Post-Intensive Care syndrome (PICS) among our survivors at a rate of 89%. This marks the first instance of a PICS survey conducted in our Intensive Care Units (ICUs). Given the absence of pre-established national data on PICS in Morocco, we have undertaken comparisons with the study conducted in Aga Khan University using the WHODAS2.0 12-items as we did .

It is observed that we obtained approximatively similar results with a slight variation. Notably in our sample 11% of survivors didn't exhibit any Post-ICU challenges , whereas at Aga khan , 28.6% showed no disability . Additionally , 40% of our survivors experienced mild PICS, compared to 24.2% at Aga khan. Moreover, in terms of moderate to severe PICS ,42.8% were observed in Aga khan , while in our study 43% exhibited a moderate PICS and 6% a severe PICS . From this comparison it appears that the frequency of PICS in Morocco is higher compared to Kenya .

Both our study and the one conducted at the Mississippi Medical Center independently affirm the presence of Post-Intensive Care Syndrome (PICS) among survivors. The Mississippi Medical Center study specifically delved into identifying challenges in various domains , highlighting that PICS predominantly manifested in the "getting around " and " participation in society " domains.

In contrast , our study which used the WHODAS2.0 12-items , identified more difficulties in the "mobility" , "getting alone" and " life activities" domains.

All the previously mentioned studies , conducted in various countries and employing diverse assessment methods, consistently underscore the deterioration of the quality of life following the Intensive Care Unit (ICU) stay. The common observation across these studies is

that a significant majority of survivors encounter disabilities in their lives post-discharge from the ICU.

The whodas2.0 fulfills the requirement for a reliable tool that can be effortlessly employed to assess the repercussion of health conditions , track the efficacy of interventions and measure to prevalence of mental and physical disorders in diverse populations .(Ustun et al)(26). In a study conducted in Korea titled "Health-related quality of life using the WHODAS2.0 and associated factors 1 year after stroke in Korea: a multi-center cross-sectional study ", the findings indicated that self-perceived disability assessed by the WHODAS2.0 had nearly twice the prevalence compared to hemiplegia , a frequent neurological consequences observed 1 year after a stroke. The study also revealed that each domain of disability exhibited an increase with various associated factors. Additionally, interventions aimed at enhancing medical adherence and motivation appeared to contribute to higher Health-Related Quality of Life (HRQol) across all domains.(lee et al) (27).

Another Korean study found a correlation between the WHODAS2.0 and disease-specific quality of life in both upper and lower extremity conditions,(HRQol). (Yoo et al) (28).

Following these statements, we proceeded to compare our study with the one conducted in Japan using the HRQol assessed by the 36-item questionnaire. In Japan , 64%of survivors displayed symptoms of PICS.In contrast, in our study which utilized the WHODAS2.0 12-items identified the presence of PICS at a high rate of 89%. This discrepancy may be attributed to variation in assessment tools, sample characteristics , and other factors influencing the outcome between the two studies .

Regarding the Micare Study conducted in the Netherlands , which used the Health Related Quality of Life (HRQol), revealed a high prevalence of Post-Intensive Care Syndrome (PICS) aligning with observations in our Moroccan Intensive Care Units (ICUs).

The study conducted at Mount Sinai Hospital in New York city (USA) revealed that 91% of survivors exhibited symptoms of the PICS , while in Morocco we found 89% of survivors with the PICS .

The second study conducted in the Netherlands which is mentioned above found a presence of 58% Post-Intensive Care syndrome (PICS) among medical ICU patients , 64% among surgical ICU and 43% among elective surgical patients . In our study conducted in Morocco , only 11% of survivors didn't present the PICS and they were all from the obstetric ICU in the University Teaching hospital Mohammed VI, while the 89% were survivors from the medical and surgical ICUs and a part of them were from the obstetric ICU too .

In New Delhi , India there were reported cognitive impairments in 25% of cases and physical illnesses in another 25% , with psychiatric illnesses ranging from 1% to 62%. In contrast, our study revealed that the predominant challenges were related to mobility , indicating a physical impairment , and emotion/participation which is associated with psychological aspects.

Studies conducted in France , the UK , and Italy align with our results , collectively indicating the presence of Post-Intensive Care Syndrome (PICS) among survivors. In the UK , similar to our study the primary challenges were observed in the mobility domain. This consistency across different locations strengthens the evidence of PICS as a common concern among individuals who have experienced intensive care.

Table IX: global PICS overview

Global context	Occurrence of PICS
PICS-MOROCCO	Occurred 89%
PICS- KENYA	Occurred 71.4%
PICS-USA-MISSISSIPI	Occurred
PICS-USA-NASHVILLE	Occurred 56%
PICS-USA-NEW-YOK	Occurred 91%
PICS-JAPANE	Occurred 64%
PICS-INDIA	Occurred
PICS-FRANCE	Occurred
PICS-NETHERLANDS	Occurred
PICS-UK	occurred
PICS-ITALY	Occurred 40%

2. Co-occurrence of PICS -related symptoms

In our examination of Post-Intensive Care Syndrome (PICS) among Moroccan survivors, we observed a co-occurrence of PICS symptoms using the WHODAS2.0 12-item tool, with its inclusion of various domains. This finding resonates with the broader global perspective on PICS worldwide, allowing a more nuanced understanding of the impact of PICS on different aspects of individuals' lives.

In our study , it is evident that our survivors face notable physical challenges, particularly expressing severe difficulty with the S1 item of the WHODAS2.0 12-item questionnaire that assesses the ability to stand for a long period such as 30 min with an average of 2.55. on the another hand we observed difficulties in the participation/emotions domain , reflected in the S5 item (How much have you been emotionally affected by your health problems?) with an average score of 2.13. Furthermore, the third significant difficulty , with an average of 1.98 pertains to maintaining life activities such as day-to-day work/school (S12).

In summary, the post-ICU lives of our Moroccan survivors have become challenging across multiple facets. Once again our goal is to implement preventive measures within our Moroccan ICUs to address and reduce these challenges in the future.

From a broader prospective , a study conducted in the USA,Nashville, investigating the co-occurrence of Post-Intensive Care Syndrome (PICS) among 406 survivors from various medical centers in Nashville, revealed that PICS manifested 3 months post-discharge at a rate of 64% and 12 months post-discharge at a rate of 56%. The co-occurrence of it in two or more domains was observed in 25% at 3 months and 21% at 12 months. Specifically , problems related to the Post-Intensive Care Syndrome across all three domains were present in only 6% at 3 months and 4% at 12 months.(Marra et al) (29).

In the previously cited PICS study in the Netherlands , which examined data from the MONITOR-IC study 1 year after the ICU admission , the findings indicated that only 12% of medical patients , 30% of urgent surgical patients , and 9% of elective surgical patients

encountered issues in two domains.Furthermore, a mere 4%,5%,and 1% , respectively , experienced challenges across all three domains . (Geense et al) (16).

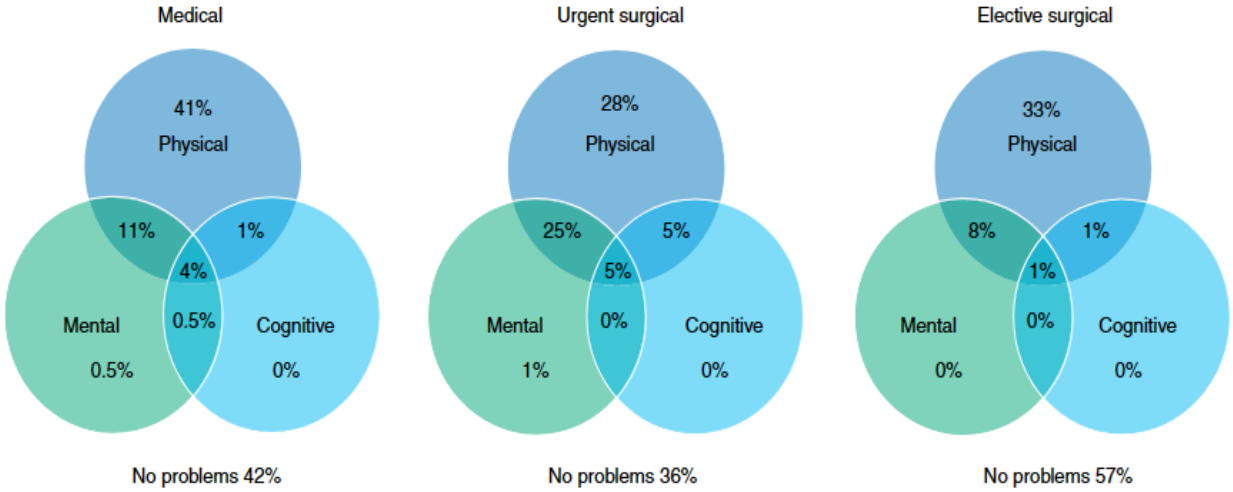

Fig35. Co-occurrence of newly experienced physical,mental,and cognitive health problems 1 year after ICU admission (16).

In Japane,as previously mentioned the proportion of survivors experiencing two or more PICS impairments was reported at 17.8%. (Kawakami et al) (18) . The figure 34 below taken from the kawakami study in Japan shows the occurrence and co-occurrence PICS impairments.

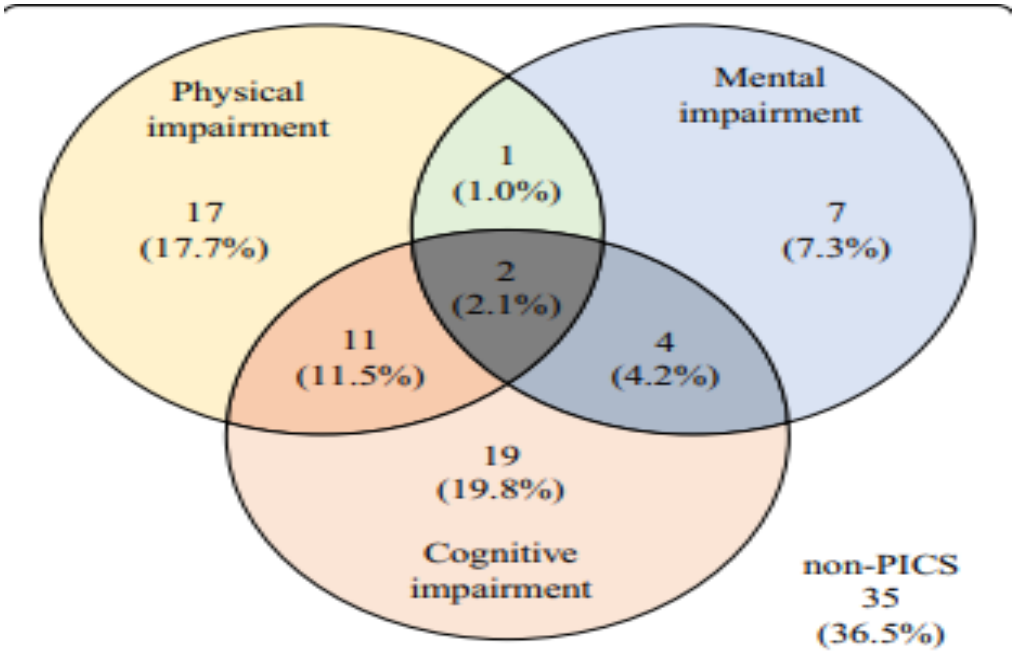

Fig36.occurence of PICS problems among patient at 6 months after ICU admission.(18)

A study conducted in Pittsburgh, Pennsylvania (USA), revealed the co-occurrence of the Post-Intensive Care Syndrome (PICS) symptoms with the following percentages: 17.5% for the co-occurrence of physical and cognitive impairments,12.3% for the co-occurrence of physical and psychological impairments, and 40.4%for the co-occurrence in all three domains-physical,cognitive,and psychological. As the figure mentioned in the Eaton et al study.(30)

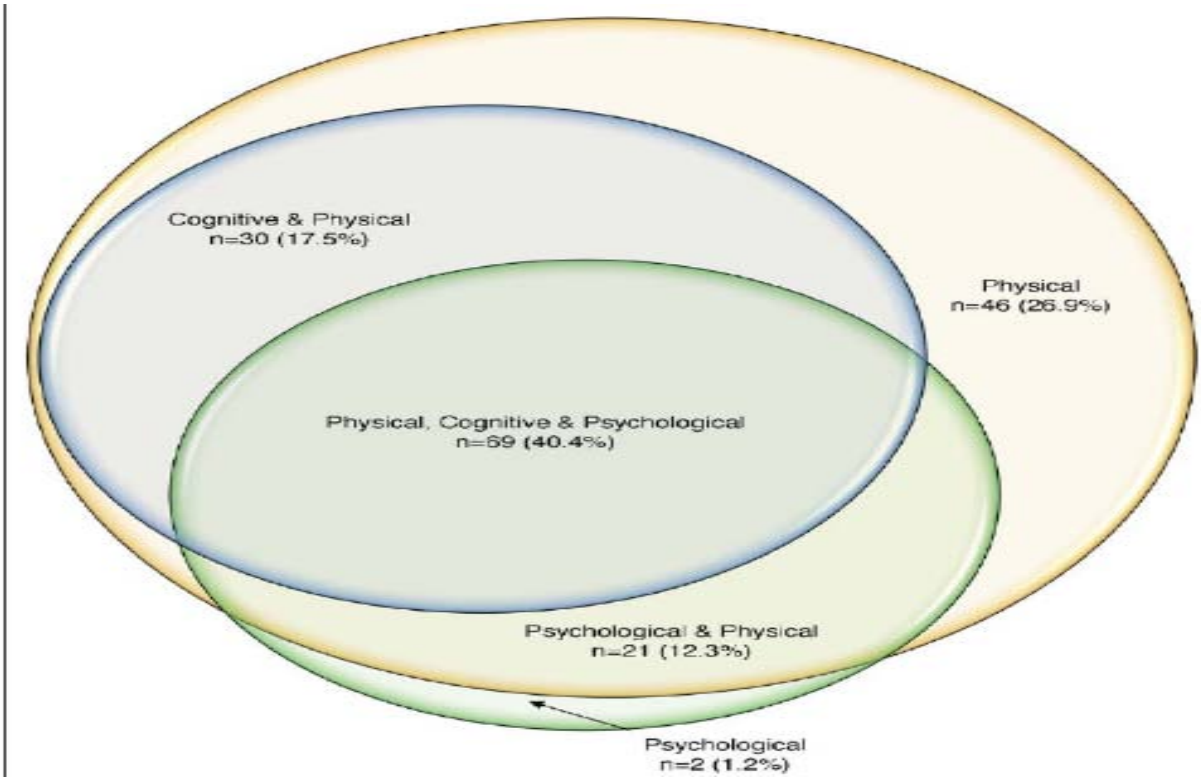

Fig37. Co-occurrence of PICS related domains (30)

In another COVID-19 study conducted in the Netherlands assessing outcomes in ICU survivors at a 1 year follow-up , it was reported that cognitive and mental impairments consistently co-occurred. (Heesakkers et al) (31).

3. Factors associated with the development of Post-Intensive Care Syndrome (PICS)

As previously mentioned, Post-intensive Care Syndrome (PICS) not only manifests significantly in the lives of survivors following discharge from the Intensive Care Unit but also tends to co-occur with various impairments .Numerous risk factors closely associated with its occurrence have been identified in the scientific literature.

3. 1 Cognitive impairment

In our sample ,the average age is 38 years old . Among cases observed , there were instances of respiratory failure ,6 cases that required non-invasive ventilation (NIV), a few occurrences of hypoxia, a limited number of cases with glucose dysregulation and hypoglycemia ,one instance of renal failure that didn't necessitate dialysis , and premorbid health conditions were identified in 20 survivors. There is no reported data about delirium in our sample. Our data aligns with the findings of many international studies conducted globally.

In the study conducted by Hopkins et al. on the two year cognitive , emotional , and quality of life outcomes in Acute Respiratory Distress Syndrome (ARDS), major risk factors associated with the cognitive impairments include the duration of delirium in the ICU , acute brain dysfunction such as stroke or alcoholism , hypoxia resulting from ARDS or cardiac arrest , hypotension associated with severe sepsis or trauma , glucose dysregulation , respiratory failure requiring prolonged mechanical ventilation, severe sepsis , use of renal replacement therapy , ARDS, and prior cognitive impairment (linked to older age , preexisting cognitive deficits, and premorbid health conditions). (Hopkins et al) (32).

In research examining factors predicting accelerated cognitive decline after intensive care unit (ICU) stays, heightened levels of delirium (or the requirement of neuroleptic medication),sepsis , hypoglycemia ,and elevated levels of NSE appear to be correlated with unfavorable cognitive outcomes.(calsavara et al) (33) .

In a research carried out in south Korea, the results indicated that delirium emerged as a prominent risk factor for cognitive impairment, with an odds ratio (OR) of 2.85 and 95% confidence interval (CI): 1.10-7.38 (lee et al) (34).

3. 2 Psychological impairment

In our sample , the majority of survivors are women, with a sex ratio of 4.48 , with an average of 38 years. During the phone interviews , a substantial number of survivors characterized their ICU experience as very negative and unpleasant. Furthermore, a notable portion of our survivors did not attend or complete school , indicating a lower education level within our sample. Besides, all of our survivors received and analgesic treatment during their ICU stay. Our findings are consistent with those observed in international studies

In the same study conducted in South Korea, notable risk factors for mental health issues encompassed female sex with odds ratio OR=3.37, 95% confidence interval CI:1.12-10.17, a history of previous mental health problems (OR=9.45,95% CI 2.08-42.90), and a negative Intensive Care Unit (ICU) experience (OR=2.59, 95% CI: 2.04-3.28) (lee et al) (34).

The systematic review conducted in the USA revealed that among seven studies, two identified female sex as a significant predictor of PTSD following the ICU care and psychological impairments. Additionally,pre-existing conditions such as depression, anxiety,PTSD,lower education levels ,and alcohol abuse were highlighted as factors that elevate the risk of acquiring mental illnesses during or after and ICU stay.(Davydow et al) (35).

In a study conducted in the USA, New York , factors associated with psychological challenges following discharge from the ICU could include preexisting disability and the administration of sedation and analgesia during the ICU stay. (Wunsch et al) (36).

3. 3 Physical impairment

In our study , emphasis was primarily placed on cognitive and psychological impairments, yet the physical aspect of Post-Intensive Care Syndrome (PICS) couldn't be disregarded,

particularly with it inclusion in the WHODAS2.0 assessment . We will briefly mention the risk factors linked to the physical impairment of PICS.

In the same South Korean study mentioned earlier , notable risk factors for physical impairment encompassed older age (OR=2.19,95% CI:1.11-4.33), female sex (OR=1.96,95% CI:1.32-2.91), and high disease severity (OR=2.54,95% CI:1.76 -3.66). (Lee et al) (34).

In our sample , as previously mentioned, the majority of survivors are women with a sex ratio of 4.48 ,and there is a noticeable prevalence of high disease severity. This aligns with the et al study.

IV. Preventive measures

Post-Intensive Care Syndrome (PICS) is a recent development in critical care medicine . Presently, the focus of critical care medicine extends beyond rescuing critical patients ,it also emphasizes the crucial goal of preventing any adverse outcomes that may arise from their ICU stay.

In Morocco, as in other countries , significant emphasis is placed on the well-being of our survivors post-discharge from ICUs, recognizing that rescuing them is a well-established task. Our approach involves comprehensive care for survivors both during and after their hospitalization, addressing their physical and psychological needs.

While we lack previous data on the prevalence or frequency of Post-Intensive Care Unit Syndrome (PICS) among Moroccan survivors , our critical care doctors employ daily preventive measures in their ICU practice. Despite challenges in citing specific studies or trials related to our population , we'll delve into global preventive measures first.

As highlighted in the Inoue et al study (37) , the ABCDE Is a well-recognized approach designed to address the risks associated with sedation, delirium, and immobility in critical care settings. The ABCDE bundle comprises the following components:

- A-airway management: assess,prevent,manage pain

- B-breathing trials: which include daily interruptions of mechanical ventilation , spontaneous awakening trials , and spontaneous breathing trials
- C-choice of analgesia and sedation ,coordination of care, and communication
- D-delirium assessment, prevention and management.
- E-early mobility and exercise

Moreover, the addition of the FGH to the preventive measures of the PICS is suggested : (Ely) (38)

- F-family involvement, follow up referrals , and functional reconciliation
- G-good handoff communicator
- H-handout materials on PICS

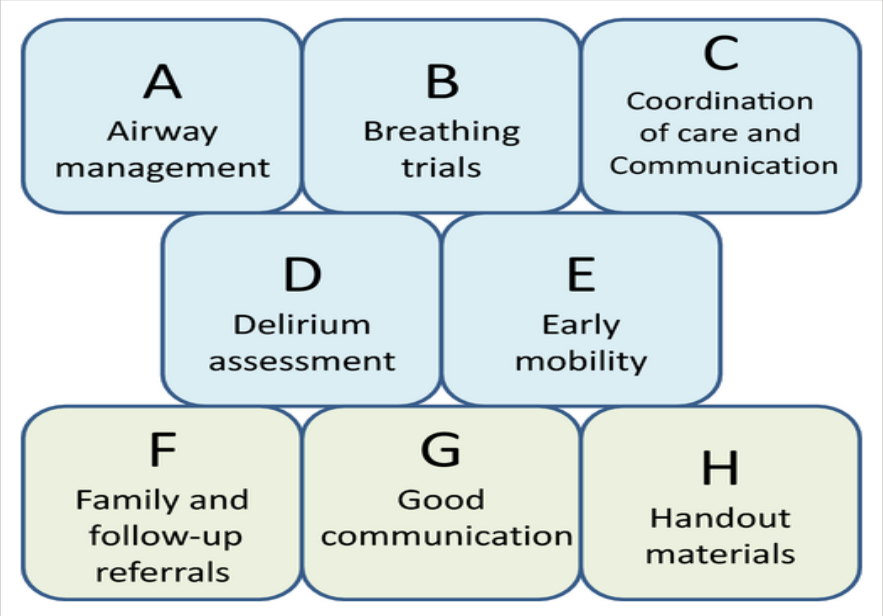

Fig.38. ABCDEFGH bundle for prevention of post-intensive care syndrome (Inoue et al) (37)

1. Physical rehabilitation

The Japanese Clinical Practice Guidelines for Management of Sepsis and Septic Shock 2016 (J-SSCG2016) recommend the implementation of early-stage rehabilitation as a preventive measure for Post-Intensive Care Syndrome (PICS) in patients with sepsis or any patient who is hospitalized in the ICU. (Nishida et al) (39) .

In a study conducted in Australia concluded that active mobilization and rehabilitation in the ICU have the potential to enhance mobility status , muscle strength , and days alive and out of hospital to 180 days . (tipping et al) (40).

A recent Japanese systematic review has clarified that physical rehabilitation reduces the incidence of ICU-acquired weakness (ICU-AW), but it does not increase delirium free days and does not show improvement in mental health . (Fuke et al) (41).

Early physical rehabilitation is recommended in critical care practice. The term “early” in the context of rehabilitation typically denotes the initiation of intensive physical rehabilitation in adding to regular care at any point during the ICU stay. It’s worth noting that the exact definition of “early” varies among studies , with the onset of interventions differing by as much as one week.(taito et al) (42).

Physical rehabilitation for mobility encompasses a range of activities , including sitting , standing , ambulation, and passive exercises such as range-of -motion exercises and ergometer use.(taioto et al) (42).

Regarding the duration and intensity of physical rehabilitation , the Australian study conducted by Tipping et al. concluded that high-dose rehabilitation might result in a higher quality of life compared to low-dose rehabilitation. However, the authors emphasized the need for further studies to provide additional clarity on this matter.(tipping et al) (40).

2. Nutrition

Nutritional therapy plays a crucial role in preventing Post-Intensive Care Syndrome (PICS) , particularly ICU-acquired weakness (ICU-AW). Ensuring sufficient energy delivery and protein intakes stands out as the key factors promoting muscle synthesis. (Philips) (43) (44), (kim et al)

Earlier research focused on nutrition therapy with outcomes centered around mortality and infectious complications. However, the recent opinion suggest that nutritional therapy should now be directed towards enhancing muscle volume and strength.(landi et al) (45).

As the figure shows below , there is a strong relation between nutritional therapy and PICS (Inoue et al) (37).

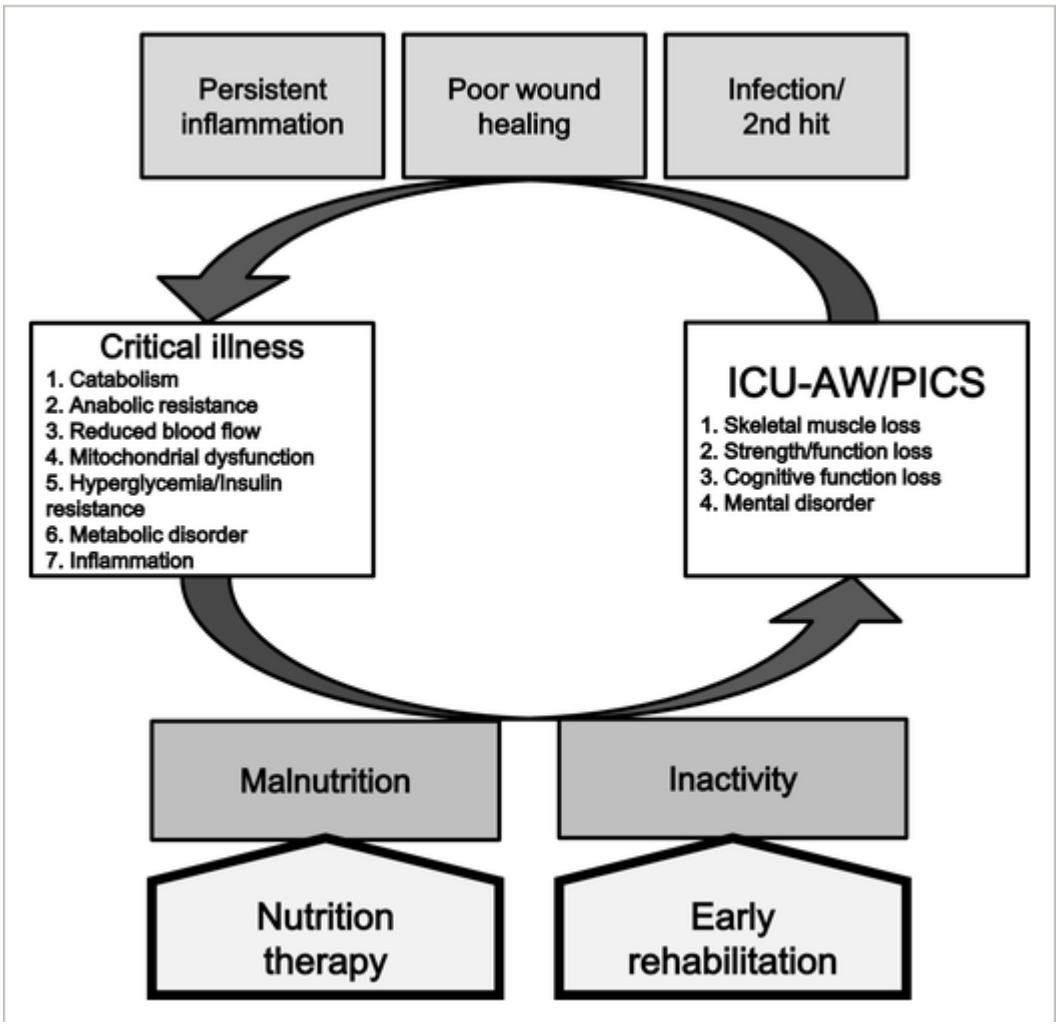

Fig39. The relation between nutritional therapy and PICS (inoue et al) (37)

Research indicates that ensuring a minimum energy delivery through supplemental parenteral nutrition during the acute phase in linked to a reduction in the occurrence of PICS.(Wischmeyer et al) (46). However, caution is advised against overfeeding through parenteral nutrition, as it may lead to autophagy impairment. The SCCM and the American society for parenteral and enteral nutrition (ASPEN) suggest through their guideline study that the focus should be on achieving appropriate energy delivery while avoiding overfeeding. (McClave et al) (47).

In the study conducted by Stanojcic et al about anabolic and anticatabolic agents in critical care it was cited that Oxandrolone and propranolol show promise in reducing long-term complications after the ICU stay, while pharmacological interventions like IGF and growth hormone help attenuate the hypermetabolic response. Maintaining a blood glucose level at 130mg/dl with intensive insulin therapy is effective but may lead to hypoglycemia. Alternative strategies, such as metformin and fenofibrate, are being explored (Stanojcic et al) (48). Further researches are needed to determine optimal glucose ranges , evaluate glucose ranges and new therapies' safety and efficacy , and explore potential synergies in co-administering these treatments for critical care patients, as it is cited in the same study (Stanojcic et al) (48).

The Italian SIAARTI survey, stated that daily caloric intake is primarily by the 25 kcal/kg equation or the commonly used Harris-Benedict formula. Indirect calorimetry is less commonly utilized. And that clinicians often personalize nutritional strategies for organ failure, following ICU protocols that prioritize enteral nutrition (EN) initiation within 2 days of admission. Supplement parenteral nutrition is added when EN is insufficient.(Cotoia et al) (49).

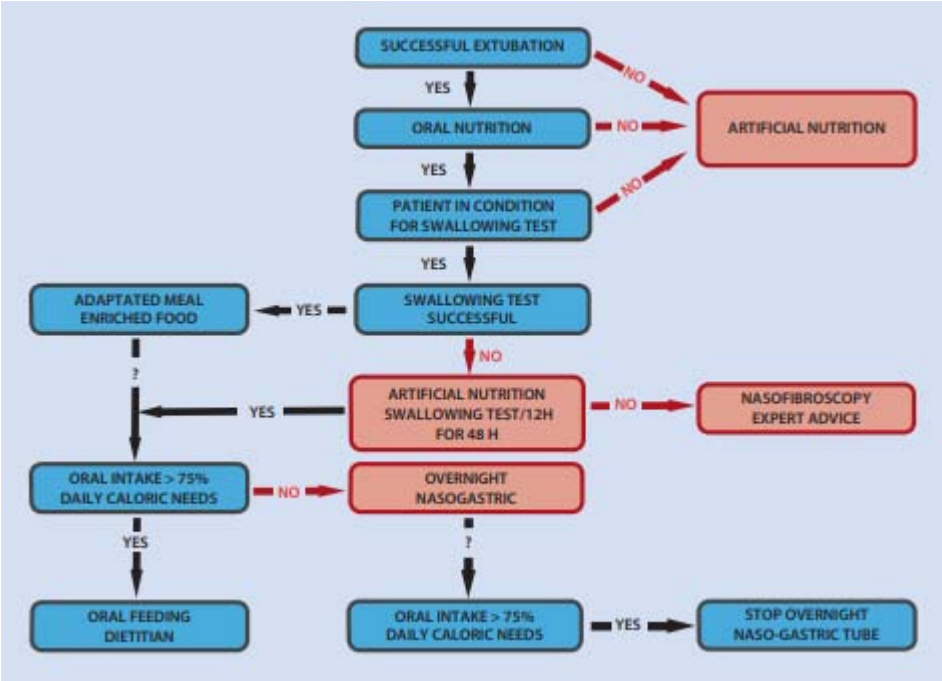

Fig40.ways of feeding ICU patients (lessons from the ICU) (8)

3. Environmental management for healing

Numerous studies stated that patients in the ICUs are exposed to various environmental factors, notably noise and light (Konkani and oakley) [ ]. A multi-center observational study conducted in Dutch ICUs revealed that ambient noise had a negative effect on the quality of sleep. (Simons et al)(50) .Conversely, a Chinese study found that the combination of earplugs and eye masks , along with the incorporation of relaxing music, had a positive impact on the sleep quality of patients. (hu et al) (51). Enhanced sleep quality through the implementation of noise reduction devises may contribute to a reduction in the incidence of delirium among ICU patients.(Litton et al) (52).

4. Nursing care for PICS

Nurses play crucial role in consistently applying measures to prevent PICS , with a focus on the ABCDEFGH bundle, they are responsible mostly in administrating analgesic and sedatives.

The majority of their time is dedicated to providing direct patient care. An American study proposes the application of Maslow's hierarchy of need to sedation, delirium , and early mobility in the ICU , suggesting that through light sedation , patients can better address higher levels of human needs. (Jackson et al) (53) .

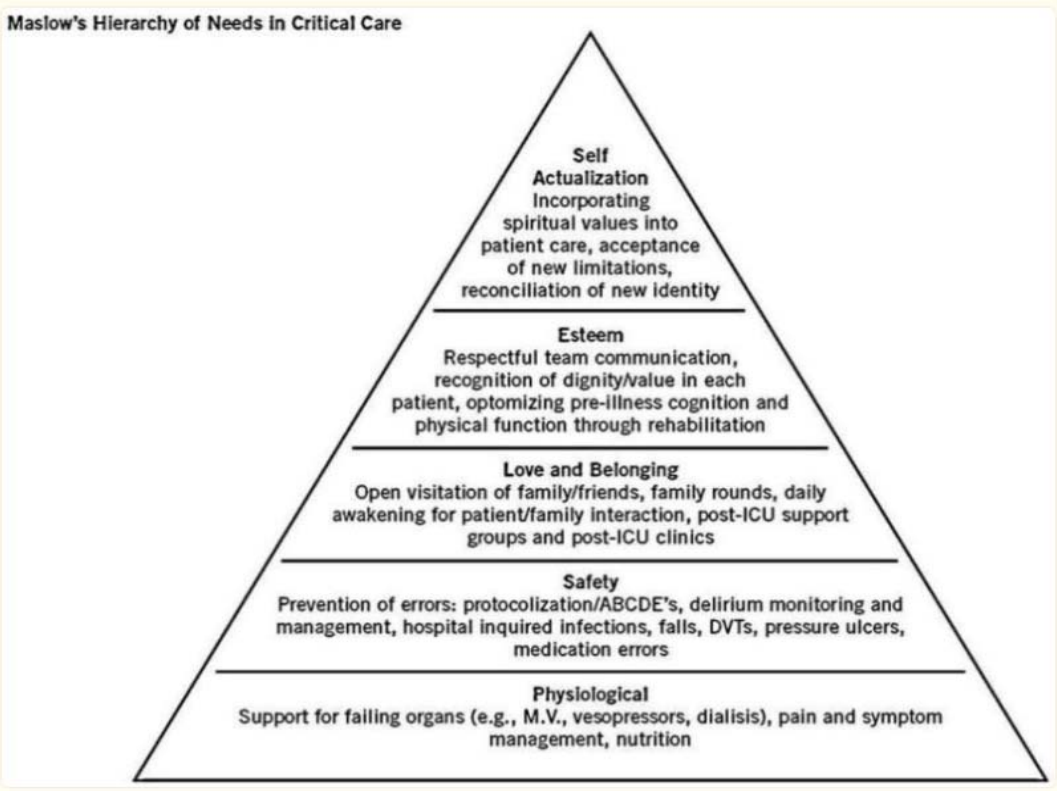

Fig.41.Maslow's hierarchy of needs adapted to the ICU (Jackson et al) (53)

The progression of recovery from Post-Intensive Care Syndrome (PICS) is a continuum. Survivors' experience led to a new theory called "embracing the new vulnerable self" (Kang and Jeong) [ ]. Sustaining functional improvement demands ongoing and uniform care beyond patient's discharge from the Intensive Care Unit (ICU) .Therefore, effective handoff communication , incorporating details about PICS is vital for maintaining this consistent care. (Elliott et al) (54).

5. ICU-diary

The ICU diary is crafted for patients during their ICU stay while they are sedated or ventilated. It can be written by family members, doctors ,nurses, medical students and others, this diary serves as a record of the patient's journey. The survivor can later read the diary, gaining a better understanding of what happened during his hospitalization in the ICU. There is a website (http://icu-diary.org) (55)which is presented as an option for creating and preserving an ICU diary. The ICU- diaries have the potential to assess the patient's orientation and may play an important role in mitigating anxiety,depression,and PTSD symptoms, thereby possibly preventing Post-Intensive Care Syndrome (PICS) as a French study showed. (Garrouste-Orgeas et al) (56). While the patient is in the ICU the nursing team led by the primary bedside nurse, determines the appropriateness of the ICU diary. If deemed beneficial , the concept is then introduced to the patient (since it can be written by the patients himself too) or survivor and their family , then the diary is initiated after obtaining their consent. (Inoue et al) (37).

The diary may include key events, daily life and rehabilitation progress. It may include photos and contributions from the doctors , physical therapist, and clinical engineering thechnicians too. The completed diary is presented to the survivor at the ICU discharge. (Inoue et al) (37).

6. Intensive care unit follow-up clinics

Follow-up clinics in the ICU are dedicated facilities designed for patients who have successfully survived their ICU stay and have been discharged. The PRaCTICal study, a randomized clinical trial (RCT) undertaken at 3 UK institutions investigating the utility of ICU l follow-up clinics, didn't support their effectiveness in enhancing survivors' quality of life during the year post-discharge from intensive care. Future efforts should shift focus towards understanding the impact of early physical rehabilitation , delirium , cognitive dysfunction , and the involvement of relatives in the recovery from critical illness. Given these results , the ICUs should reassess their follow-up programs, this opens avenues for future research within the realm of critical care medicine. (Cuthbertson et al) (57).

RECOMMENDATIONS

The post-discharge lives of ICU survivors have become a global concern. Many countries are addressing this issue seriously, implementing various measures and strategies to improve conditions both during and after the ICU stay. While overcoming mortality has made a significant progress, the focus has shifted towards enhancing the quality of life for individuals post-ICU.

In our Moroccan ICU, we have successfully enhanced our capabilities in managing mortality among our patients. Now our attention has shifted toward addressing the aftermath of ICU experience, particularly the challenges associated with Post-Intensive Care Syndrome (PICS). This shift underscores the needs for ongoing efforts to improve the overall well-being and quality of life for Moroccan individuals after their intensive care stay.

Some measures that can be implemented include, but are not limited to:

❖ Primarily, in our Moroccan ICUs it is essential to initiate an extensive awareness campaign in Arabic,French, and Tamazight about Post-Intensive Care Syndrome (PICS) among our health care professionals across Moroccan ICUs, including critical care doctors and nurses , medical students and technicians . This involves fostering a comprehensive mindset within the ICU community which aligns with our cultural nuances through educational courses that cover various aspects of PICS , including its risk factors , preventive measures, and its overall impact on survivors.

❖ Given that the mental aspect significantly contributes the overall quality of life, it underscores the primary role of a psychiatrist in addressing mental health concerns . I recommend initiating and strengthening collaborations between critical care doctors and psychiatrists. This collaboration can leverage the expertise of both specialties to provide specialized treatments and psychotherapies, acknowledging our cultural sensitivity regarding mental health. By working together, they can address not only the immediate needs of patients during their ICU stay but also extend support for cognitive and psychological impairments that often accompany Post-Intensive Care Syndrome (PICS). Proactive engagement with patients during their stay may even contribute to preventing or mitigating the development of PICS.

❖ Establishing a national program and standardized protocols for addressing Post-Intensive Care Syndrome (PICS) in Moroccan ICUs is recommended. This initiative should involve a multidisciplinary approach, requiring expertise from critical care doctors, psychiatrists or psychologists, nutritionist, physical therapists, nurses and other relevant professionals. Collaborating among these specialties will surely respect the local clinical practices and their availability which can contribute to a comprehensive and effective strategy to address the various aspects of PICS, promoting better patients outcomes and improved overall quality of life.

❖ It is advisable to offer specific training programs for nurses, focusing on Post-Intensive Care Syndrome (PICS) and aligning with national standards and recommendations on analgesia and sedation. Given that nurses have significant and consistent interaction with ICU patients, acknowledging their pivotal role, these targeted trainings can enhance their understanding and management of PICS-related issues. This approach ensures that nurses are well-equipped to provide comprehensive care, adhering to established national guidelines .

❖ Raising awareness among survivors after their discharge is crucial. Survivors need insights into the potential consequences of their ICU stay. Affecting various aspects of their lives. This awareness can be effectively facilitated with the assistance of a psychologist or psychiatrist ,or any critical care staff. It is essential for survivors to comprehend what transpired , what is currently happening , and what to expect in the future. Communication is important, this would be facilitated using local languages in the educational materials dedicated to this awareness campaign.

❖ Implementing the ICU-diary in Moroccan ICUs could be a valuable approach, particularly if it involves entries written by the patients themselves or their families. This initiative can contribute to a more comprehensive understanding and acknowledgment of the ICU experiences, fostering a sense of control and better psychological adjustment for the survivors.

❖ Survivors should have convenient access to a psychiatrist who can provide psychological treatment. Therefore, it is recommended that a psychiatrist or psychologist be readily available and linked to each ICU in the hospital, prepared to assist survivors who seek their help, considering our Moroccan healing practices.

❖ It is also recommended to involve family members in the prevention process by providing them too with information using our local languages about what Post-Intensive Care Syndrome (PICS) entails. Terming it PICS-Family, they can be educated on the potential impact on their own well-being and how can they support the survivor in their journey toward mental and cognitive recovery .Encouraging their participation in support programs is essential for fostering a healthier post-ICU life for both the survivor and their family.

❖ Post-ICU support groups , resembling group therapy facilitated by a psychiatrist , might be valuable concept for the healing process, taking in consideration our Moroccan ethical, cultural, and religious values.

❖ Establishing a comfortable environment in our Moroccan ICUs for the patients is crucial . This involves minimizing disturbances , such as noise from staff or machinery , particularly during the night to enhance quality sleep. Consideration could be given to providing patients with noise-canceling headphones , and efforts should be made to limit light exposure during their sleep, creating a more conductive and restful atmosphere, adhering to our Moroccan hospitals infrastructure.

❖ Regarding nutrition in the ICU, it is highly recommended to ensure patients receive sufficient energy and protein intake , aiming to support muscle volume and strength without causing overfeeding. To enhance anabolic power, consideration may be given to providing supplements such as β-hydroxy-β-methylbutyrate (HMB) ,oxandrolone,and amino acids like leucine to facilitate muscle protein synthesis. Additionally, maintaining appropriate glucose levels is crucial. Personalizing nutrition plans for each patient may be very interesting, aligning

with our Moroccan cooking and seeking the expertise of our Moroccan nutritionists or a dieticians can be beneficial. Whenever feasible, prioritize enteral nutrition for optimal outcomes. Nutritional rehabilitation programs are to think of too and malnutrition should be avoided in the ICU. Enhancing challenges related to poor appetite and early satiety can be achieved by offering small ,regular, and energy-dense meals and snacks , also fighting nausea and vomiting is important . Moreover, supporting the patient/survivor in accepting changes to their body and establishing patient-centered goals for recovery is important.

The patients' nutritional needs should be routinely discussed by the multidisciplinary team .

❖ In other aspect, it is advisable to implement early-stage physical rehabilitation in the ICUs with the assistance of a physical therapist, including our Moroccan techinques in this field. Encouraging early mobilization and frequent rehabilitation for patients/ survivors can contribute significantly to their recovery process.

❖ For patients undergoing mechanical ventilation in the ICU , it is advisable to incorporate daily mechanical ventilation interruptions and spontaneous breathing trials. Strive to extubate intubated patients promptly, facilitation a gradual withdrawal from mechanical ventilation. Considerating our Moroccan economic resources.

❖ Supporting light sedation can be beneficial. Analgesia should be wisely administered in the ICU. Both analgesia and sedation should align with the International recommendations and standards, and explaining it to the patients and their families is important.

❖ Effective management of survivors' files and documents is important, assessing PICS after discharge and facilitating future studies on PICS become more streamlined with organized and accessible records

❖ Supporting Moroccan spiritual and religious values among our Moroccan survivors and embracing the "new identity after the ICU discharge" to help survivors get through it toward a path of a complete healing.

❖ Ensure that all these recommendations are financially accessible for patients.

❖ Recognizing that a patient is a holistic entity encompassing both physical and mental aspects should be integrated into every medical practice. While addressing urgent physical distress is essential, it is equally crucial not to overlook mental distresses of the patient .

CONCLUSION

Post-Intensive Care Syndrome represents the cognitive, psychological, and physical impairments that manifest following discharge from the intensive care unit. This is a newly recognized entity in our Moroccan intensive care units .

Whit increased efforts from the multidisciplinary staff, proactive measures can be taken to prevent Post-Intensive Care Syndrome. This approach aims to make life after Intensive Care Unit discharge more manageable for survivors, facilitating their smooth integration into society.

We conducted a cross-sectional study , involving a total 70 files from survivors across medical , surgical, and obstetrics ICUs at the Mohammed VI University Hospital of Marrakech. The files of survivors were collected from December 2022 to august 2023.

This study allowed us to evaluate the frequency of Post-Intensive Care Syndrome in Morocco as well as its risk factors and most importantly discuss its prevention . Our study introduces a novel approach to Moroccan critical care medicine , emphasizing the enhancement of healthcare provision during and after Intensive Care Unit stay. The focus is on improving the overall quality of critical care medicine in Morocco. The outcome of this study are expected to benefit both the staff and survivors admitted to the Intensive Care Units, as the research is designed to promote their health before and beyond critical illness.

In our study the global frequency of Post-Intensive Care Syndrome is determined to be 89% . The findings indicate that the lives of survivors post Intensive Care unit is very challenging , with a noticeable decrease in their overall life quality.

An interesting finding in our study is the identification of a notable approach. Beyond the significant presence of Post-Intensive Care Syndrome , there was a co-occurrence observed.

Numerous risk factors were examined , and preventive measures were recommended to reduce the occurrence of Post Intensive Care Syndrome among Moroccan survivors in the future, it is a feasible task to do in our Moroccan Intensive Care Unit.

APPENDIX

DATA COLLECTION FORM

File number:

ICU:

Phone number:

First name:

Last name:

Age:

Sexe:

Marital status:

Profession:

Place of residence:

Education :

Medical record:

Use any addictive substances (alcool/Tobacco/cannabis…):

Number of days spent in the intensive care unit(ICU) : -the admission date: -discharge date:

Medications and drugs received during the ICU stay :

Mechanical ventilation: -non invasive ventilation:

-invasive mechanical ventilation: intubation / tracheostomy

إن هذا الاستبيان يتعلق بالصعوبات والعوائق الناتجة عن ظروفٍ صحية. تشملُ الظروفُ الصحية أمراضً، عللً، مشاكلً صحية أخرى قد تكون قصيرة أو طويلة الأمد، إصاباتً، مشاكلً نفسية أو عاطفية ومشاكل بسبب الكحول أو المخدرات.

فكر في الثلاثين يومٍ الماضية وأجب عن هذه الأسئلة، فكر كم كان من الصعب أن تقوم بالأنشطة التالية. يرجى وضع دائرة واحدة على جوابك مِنْ أجلِ كل سؤالٍ.

This questionnaire asks about difficulties due to health conditions. Health conditions include diseases or illnesses, other health problems that may be short or long lasting, injuries, mental or emotional problems, and problems with alcohol or drugs.

Think back over the past 30 days and answer these questions, thinking about how much difficulty you

had doing the following activities. For each question, please circle only one response.

كبيرةجدا/لا أستطيع Extreme or cannot do	كبيرة Severe	متوسطة Moderate	قليلة Mild	لا صعوبات None	خلال الثلاثين يوما الماضية ما هو مدى الصعوبات التي اعترضتك في: In the past 30 days, how much difficulty did you have in:	
4	3	2	1	0	الوقوف لمدة طويلة، مثلا 30 دقيقة؟ Standing for long periods such as 30 minutes?	1
4	3	2	1	0	تحمل مسؤولياتك الأسريّة ؟ Taking care of your household responsibilities?	2
4	3	2	1	0	تعلّم أشياء جديدة مثل تعلّم كيفيّة الذهاب إلى مكان جديد؟ Learning a new task, for example, learning how to get to a new place?	3
4	3	2	1	0	ما هو مدى المشاكل التي اعترضتك في متابعة أنشطة اجتماعية (مثل الاحتفالات أو التظاهرات أو أنشطة أخرى) بنفس الطريقة التي يقوم بها أي شخص آخر؟ How much of a problem did you have joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?	4
4	3	2	1	0	إلى أي مدى تأثرت عاطفيًا بمشكلاتك الصحية؟	5

					How much have you been emotionally affected by your health problems?	
ك بيرةجدا/لا أستطيع Extreme or cannot do	ك بيرة Severe	متو سطة Moderate	ق ليلة Mild	لا صعوبات None	خلال الثلاثين يوما الماضية ما هو مدى الصعوبات التي اعترضتك في: In the past 30 days, how much difficulty did you have in:	
4	3	2	1	0	التركيز في عمل شيء ما مدة 10 دقائق؟ Concentrating on doing something for ten minutes?	6
4	3	2	1	0	المشي مسافة طويلة مثل كيلومتر واحد [أو ما يعادله] Walking a long distance such as a kilometer [or equivalent]?	7
4	3	2	1	0	غسل جسمك بأكمله ؟ Washing your whole body?	8
4	3	2	1	0	ارتداء الثياب ؟ Getting dressed?	9
4	3	2	1	0	التعامل مع أشخاص لا تعرفهم ؟ Dealing with people you do not know?	10
4	3	2	1	0	المحافظة على صداقة؟ Maintaining a friendship?	11
4	3	2	1	0	عملك اليومي/ دراستك اليومية؟ Your day-to-day work/school?	12

عدد الأيام: _____ ***Record number of days***	إجمالاً، كم عدد الأيام التي كانت فيها هذه الصعوبات موجودة على مدار الثلاثين يومًا الماضية؟ Overall, in the past 30 days, how many days were these difficulties present?	1
عدد الأيام: _____	على مدار الثلاثين يومًا الماضية، كم عدد الأيام التي كنت فيها غير قادر كليًا على القيام بالأنشطة المعتادة أو عملك بسبب حالة صحية ما؟	2

Record number of days	In the past 30 days, for how many days were you totally unable to carry out your usual activities or work because of any health condition?	
عدد الأيام: _____ ***Record number of days***	على مدار الثلاثين يومًا الماضية، بغض النظر عن الأيام التي كنت فيها غير قادر كليًا، كم يومًا قلصت أو خفضت أنشطتك المعتادة أو عملك بسبب حالة صحية ما؟ In the past 30 days, not counting the days that you were totally unable, for how many days did you cut back or reduce your usual activities or work because of any health condition?	3

(3)

RESUMES

Abstract

Introduction:

Post Intensive Care Syndrome (PICS) includes long-term cognitive, psychological, and physical issues during and after an ICU stay. While it has only been extensively discussed in recent decades, it has now become a significant focus in global critical care medicine. Our study's main objective is to recognize the significant challenges posed by PICS within our country and raise awareness of it. Moreover, we aim to formulate strategies for preventing and managing post-intensive care syndrome.

Patients and methods:

In this cross-sectional study, we gathered data from files of various ICUs affiliated with the Mohammed VI University Teaching Hospital in Marrakech, spanning from December 2022 to August 2023.. We utilized the World Health Organization Disability Assessment Schedule 2.0 as our tool to examine post-intensive care-related symptoms. Interviews were conducted via phone calls, and data analysis was performed using Microsoft Excel and SPSS.

Results:

The study findings indicated that among Moroccan survivors, there was a high prevalence of post-intensive care syndrome, with approximately 89% experiencing its effects. The most notable challenges were observed in two main areas: the physical ability to stand for extended periods, particularly for 30 minutes or more, and difficulties within the participation/emotion domain, suggesting issues with emotional well-being and engagement in daily activities.These findings shed light on the complex nature of post-intensive care syndrome, demonstrating its multidimensional impact on survivors' lives. By assessing various domains, such as physical function and emotional well-being, the study highlighted the interconnectedness of symptoms and their co-occurrence among survivorsMoreover, the study identified specific factors that were associated with the presence of post-intensive care symptoms within the sample. These factors

could include medical history, severity of illness during the ICU stay, duration of mechanical ventilation, and other relevant variables. Understanding these contributing factors is crucial for developing targeted interventions and support strategies for survivors of intensive care treatment

Conclusion

In conclusion, the study highlighted the significant presence of post-intensive care syndrome among Moroccan ICU patients. Given its prevalence and impact on survivors' well-being, there is a pressing need for increased attention and focus on prevention efforts. Prevention strategies are not only feasible but also essential for promoting the healing and recovery of patients within Moroccan ICUs. By prioritizing prevention measures, we can work towards improving the long-term outcomes and quality of life for ICU survivors in Morocco.

The main recommendations include focusing on nutrition, sedation management, physical therapy, psychological support, and education for both patients,families and ICU staff

Résumé

Introduction :

Le syndrome post-soins intensifs (PICS) comprend des problèmes cognitifs, psychologiques et physiques à long terme pendant et après un séjour en unité de soins intensifs (USI). Bien qu'il n'ait été largement discuté que ces dernières décennies, il est désormais devenu un sujet majeur dans la médecine critique mondiale. L'objectif principal de notre étude est de reconnaître les défis importants posés par le PICS dans notre pays et de sensibiliser à ce sujet. De plus, nous visons à formuler des stratégies de prévention et de gestion du syndrome post-soins intensifs.

Patients et méthodes :

Dans cette étude transversale, nous avons recueilli des données à partir de dossiers de divers services de réanimation affiliés à l'Hôpital Universitaire Mohammed VI de Marrakech, couvrant la période de décembre 2022 à août 2023. Nous avons utilisé l'échelle d'évaluation de l'Organisation mondiale de la santé pour les incapacités 2.0 comme outil pour examiner les symptômes liés aux soins intensifs postérieurs. Les entretiens ont été menés par téléphone et l'analyse des données a été réalisée à l'aide de Microsoft Excel et SPSS.

Résultats :

Les résultats de l'étude ont indiqué qu'entre les survivants marocains, il y avait une prévalence élevée du syndrome post-soins intensifs, environ 89% en ont subi les effets. Les défis les plus remarquables ont été observés dans deux domaines principaux : la capacité physique à rester debout pendant de longues périodes, en particulier pendant 30 minutes ou plus, et des difficultés dans le domaine de la participation/émotion, suggérant des problèmes de bien-être émotionnel et d'engagement dans les activités quotidiennes. Ces résultats mettent en lumière la nature complexe du syndrome post-soins intensifs , démontrant son impact multidimensionnel sur la vie des survivants. En évaluant divers domaines, tels que la fonction physique et le bien-

être émotionnel, l'étude a souligné l'interconnexion des symptômes et leur co-occurrence chez les survivants. De plus, l'étude a identifié des facteurs spécifiques associés à ce syndrome dans l'échantillon. Ces facteurs pourraient inclure les antécédents médicaux, la gravité de la maladie pendant le séjour en réanimation, la durée de la ventilation mécanique, et d'autres variables pertinentes. Comprendre ces facteurs contributifs est crucial pour développer des interventions ciblées et des stratégies de soutien pour les survivants du traitement en réanimation.

Conclusion :

En conclusion, l'étude a mis en évidence la présence significative du syndrome post-soins intensifs parmi les patients des services de réanimation marocains. Compte tenu de sa prévalence et de son impact sur le bien-être des survivants, il est nécessaire d'accorder une attention accrue aux efforts de prévention. Les stratégies de prévention sont non seulement faisables mais également essentielles pour favoriser la guérison et la récupération des patients dans les services de réanimation marocains. En donnant la priorité aux mesures de prévention, nous pouvons œuvrer à l'amélioration des résultats à long terme et de la qualité de vie des survivants en réanimation au Maroc.

Les principales recommandations incluent la focalisation sur la nutrition, la gestion de la sédation, la thérapie physique, le soutien psychologique et l'éducation, à la fois pour les patients, les familles et le personnel des services de réanimation.

ملخص

مقدمة

متلازمة ما بعد العناية المكثفة تشمل القضايا العقلية والنفسية والجسدية طويلة الأجل أثناء وبعد البقاء في وحدة العناية المركزة. بينما كانت محل نقاش واسع النطاق في العقود الأخيرة فقط، إلا أنها أصبحت الآن محورًا هامًا في الطب الحرج العالمي. الهدف الرئيسي لدراستنا هو التعرف على التحديات الهامة التي تواجه متلازمة في بلادنا ورفع الوعي بها. علاوة على ذلك، نهدف إلى وضع استراتيجيات لمنع وإدارة متلازمة الرعاية المكثفة بعد العناية

المواد والأساليب

في هذه الدراسة المستعرضة، جمعنا البيانات من ملفات مختلفة لوحدات العناية المركزة التابعة لمستشفى الجامعة محمد السادس للتعليم الطبي في مراكش، والتي تمتد من ديسمبر 2022 إلى أغسطس 2023. استخدمنا جدول تقييم الإعاقة الخاص بمنظمة الصحة العالمية ٢.٠ كأداة لفحص الأعراض ذات الصلة بالرعاية المكثفة اللاحقة. تم إجراء المقابلات عبر المكالمات الهاتفية، وتم تحليل البيانات باستخدام برنامجي إكسل من مايكروسوفت و إس بي إس إس

نتائج

أظهرت نتائج الدراسة أنه بين الناجين المغاربة، كانت هناك انتشار عالٍ لمتلازمة الرعاية المكثفة اللاحقة، حيث شعر بها حوالي 89% منهم. لاحظت التحديات البارزة في مجالين رئيسيين: القدرة البدنية على الوقوف لفترات ممتدة، خاصة لمدة 30 دقيقة أو أكثر، والصعوبات في مجال المشاركة/العاطفة، مما يشير إلى مشاكل في الرفاهية العاطفية والمشاركة في الأنشطة اليومية. تسلط هذه النتائج الضوء على الطبيعة المعقدة لمتلازمة الرعاية المكثفة اللاحقة، مما يظهر تأثيرها متعدد الأبعاد على حياة الناجين. من خلال تقييم مختلف المجالات، مثل الوظيفة البدنية والرفاهية العاطفية، أبرزت الدراسة الارتباط بين الأعراض وتزامنها بين الناجين. علاوة على ذلك، تم تحديد عوامل محددة ترتبط بوجود أعراض متلازمة الرعاية المكثفة في العينة. يمكن أن تتضمن هذه العوامل التاريخ الطبي، وشدة المرض أثناء البقاء في وحدة العناية المركزة، ومدة التنفس الميكانيكي، ومتغيرات أخرى ذات صلة. فهم هذه العوامل المساهمة أمر بالغ الأهمية لتطوير تدخلات مستهدفة واستراتيجيات دعم لناجين علاج العناية المكثفة.

خاتمة

في الختام، أبرزت الدراسة وجودًا ملحوظًا لمتلازمة الرعاية المكثفة اللاحقة بين مرضى وحدات العناية المركزة المغاربة. نظرًا لانتشارها وتأثيرها على رفاهية الناجين، فإن هناك حاجة ملحة لزيادة الاهتمام والتركيز على جهود الوقاية. إن استراتيجيات الوقاية ليست فقط ممكنة ولكنها أيضًا ضرورية لتعزيز الشفاء واستعادة المرضى داخل وحدات العناية المركزة المغربية. من خلال إعطاء الأولوية لتدابير الوقاية، يمكننا العمل نحو تحسين النتائج على المدى الطويل وجودة الحياة لناجين وحدات العناية المركزة في المغرب .تشمل التوصيات الرئيسية التركيز على التغذية وإدارة التخدير والعلاج الطبي والدعم النفسي والتعليم لكل من المرضى وأسرهم وموظفي وحدات العناية المركزة.

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قسم الطبيب

أقْسِم بِالله العَظِيم

أن أراقبَ الله في مِهْنَتِي.

وأن أصُونَ حياة الإنسان في كآفّة أطوَارهَا في كل الظروف

والأحَوال باذلا وسْعِي في إنقاذها مِن الهَلاك ِوالمرَضِ

و الألَم والقَلَق.

وأن أحفَظَ لِلنَاسِ كرَامَتهُم، وأسْتر عَوْرَتهُم، و أكتمَ

سِرَّهُمْ.

وأن أكونَ عَلى الدوَام من وسائِل رحمة الله، باذلا رعايتي الطبية للقريب

والبعيد،للصالح والطالح، والصديق والعدو.

وأن أثابر على طلب العلم، وأسَخِّرَه لِنَفْعِ الإِنْسَان لا لأذَاه.

وأن أُوَقّر َمَن عَلَّمَني،وأُعَلّمَ مَن يصغرني، وأكون أخا لِكُلِّ زَميلٍ في المِهنَةِ الطِّبِّيَة

مُتعَاونِينَ عَلى البرِّ و التقوى.

وأن تكون حياتي مِصْدَاق إيماني في سِرّي وَعَلانيَتي ،نَقِيَّة مِمّا يشينها تجَاهَ

الله وَرَسُولِهِ وَالمؤمِنين.

والله على ما أقول شهيد

كليـــــــة الـطـب
و الصيدلة - مراكش
FACULTÉ DE MÉDECINE
ET DE PHARMACIE - MARRAKECH

MARRAKECH
جامعة القاضي عياض
UNIVERSITÉ CADI AYYAD

سنة 2024 أطروحة رقم 157

متلازمة ما بعد العناية المركزة نظرة عامة على الإعاقات المعرفية والنفسية في وحدة العناية المركزة المغربية للبالغين

الأطروحة

قدمت ونوقشت علانية يوم **26 / 04 / 2024**

من طرف

السيدة ياسمين عماري

المزدادة في 04 شتنبر 1997 بمراكش

لنيل شهادة الدكتوراه في الطب

الكلمات الأساسية:

نفسي - متلازمة ما بعد العناية المركزة - جدول تقييم الإعاقة الخاص بمنظمة الصحة العالمية 2.0 - عقلي.

اللجنة

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المشرف	**السيد ي.زروقي** أستاذ في طب الإنعاش الجراحي	
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