



## RESEARCH ARTICLE

# Effectiveness of Self-Instructional Module on Pregnant Women's Knowledge and Awareness Regarding Pregnancy Associated Stroke Risk

<sup>1,2</sup>aFatma Aboulkhair Farag\*, <sup>b</sup>Samah Zidan, <sup>c</sup>FerialFouad Melika, <sup>d</sup>Hemmat Moustafa Abdel Mageed and <sup>f</sup>ShimaaMohamady

\*<sup>a1</sup>PhD, RN, Assistant Professor of Maternal and Newborn Health Nursing, Faculty of Nursing, Fayoum University- Egypt

\*<sup>a2</sup>PhD, RN, Assistant Professor of Maternal and Neonatal Health Nursing, School of Nursing, Bader University in Cairo- Egypt

<sup>b</sup>PhD, RN, Lecturer of Adult Health Nursing, School of Nursing, Badr University in Cairo - Egypt

<sup>c</sup>PhD, RN, Assistant Professor of Community Health Nursing, Faculty of Nursing, Ain Shams University - Egypt

<sup>d</sup>PhD, RN, Lecturer of Maternal and Newborn Health Nursing, School of Nursing, Badr University in Cairo- Egypt

<sup>f</sup>PhD, RN, Assistant Professor of Maternal and Newborn Health Nursing, Faculty of Nursing, Helwan University- Egypt

## Abstract

**Background:** Stroke is one of the leading causes of death globally. Pregnancy and the puerperium increase the risk of ischemic and hemorrhagic stroke, with rates three times higher than in non-pregnant women. Knowledge and awareness of pregnancy-associated stroke risk factors and warning signs are important for stroke prevention and seeking early care. Prenatal education is an important component of supporting and maintaining a healthy pregnancy, Objectives: This study was to assess the effectiveness of a self-instructional module on pregnant women's knowledge and awareness regarding risk factors and warning signs of pregnancy-associated stroke. Methods: A quasi-experimental design (one group pre- posttest design) was used. A purposive sample of (100) stroke-risk pregnant women. Tool: Three instruments were used to collect the current study data, A self-administered questionnaire, The stroke knowledge questionnaire (SKQ), and the stroke awareness questionnaire (SAQ). Main Results: The current study findings revealed statistically significant differences showing that more than two-thirds (70%) of the participants had a poor level of knowledge before the intervention compared to about four-fifths (79%) of them had good knowledge after the intervention ( $p < 0.001$ ) and before /after knowledge mean scores were  $(5.70 \pm 2.35)$  and  $(25.56 \pm 4.11)$ , respectively. In addition, three-quarters of the participants (75%) had a poor level of awareness before the intervention compared to the vast majority of them (82%) had a good level after the intervention ( $P < 0.001$ ). Conclusions and Recommendations: Self-instructional module succeeded in inducing statistically significant improvements in pregnant women's knowledge and awareness about pregnancy-associated stroke. Regular continuing education programs should be conducted in antenatal care units regarding pregnancy-related stroke risk factors, warning signs, and how to maintain healthy lifestyles during pregnancy.

**Key Words:** Self-Instructional Module- Pregnancy Associated Stroke – Knowledge – Awareness- Risk Factors- Warning Signs

Copyright : © 2021 The Authors. Published by Innovative Journal. This is an open access article under the CC BY-NC-ND license

## 1 | INTRODUCTION

Stroke is a neurological emergency and a major cause of disability and death around the world (Karjalainen et al., 2019). Stroke (ischemic or hemorrhagic), defined as a neurological emergency associated with an acute focal injury of the central nervous system due to vascular effects, may occur as a result of cerebral infarction or intracranial haemorrhages (Ban et al., 2017).

Stroke associated with pregnancy and post-partum occurs in about 30 per 100,000 deliveries and includes subtypes of ischemic and hemorrhagic stroke as well as Cerebral Venous Sinus Thrombosis (CVST)(Liu et al., 2019).The proportion of each stroke type is widely different during pregnancy compared to older, non-pregnant adults, where ischemic stroke accounts for about 85%, hemorrhagic strokes 15%, and CVST about 1% of all strokes (Hassan et al., 2020). The timing of stroke during pregnancy appears to be more common at the time of delivery (41%) and postpartum periods (48%), than in the antepartum period (11%)(Ban et al., 2017). The stroke rate during antepartum/peripartum periods was 18.3 per 100,000 deliveries and 14.7 during postpartum based on a systematic review of 10 studies where the antepartum and peripartum time periods were combined (Swartz et al., 2017)

Stroke in pregnancy is of particular importance not just because it affects women of reproductive age, but because it is often a result of specific pregnancy-associated conditions and is potentially preventable. Stroke is the third leading cause of death among women in the United States (U.S.). The outcome of stroke is significant among women survivors. It is estimated that 31% will need help caring for themselves, 16% will require institutional care, and 7% will have an impaired ability to return to work and daily life(Elsaid et al., 2021)

Equated with similarly aged nonpregnant women, pregnant and postpartum women are at increased risk for stroke due to pregnancy-related physiological changes, such as severely elevated blood pressure and hypercoagulability, classic vascular risk factors, and other poorly understood mechanisms. In addition, pregnancy, and the puerperium itself are associated with an increased risk of cerebrovascular disease caused by pregnancy-related disorders such as gestational hypertension and preeclampsia(Liu et al., 2019).

Various risk factors trigger nurses and other Health Care Providers (HCPs) to act immediately. Hypertension is one of the most modifiable risk factors for stroke. Another well-established risk factor for ischemic stroke is diabetes, which is also an important risk for complications during pregnancy. The prevalence of gestational diabetes is increasing, likely due to the increase in obesity in younger women and women becoming pregnant later during childbearing years(Miller et al., 2017).

Pregnancy increases the risk of thrombosis three-to-four-fold thrombotic disorders and the development of thrombosis during pregnancy come from a convergence of factors which all provide a favourable environment for both arterial and venous clot formation. These factors are not limited to physiologic changes in pregnancy itself. Many women become less physically active as pregnancy progresses. In addition, nausea and vomiting can lead to dehydration. These factors together create a favourable environment for thromboembolism (Khalid et al., 2020).

Further, on than pregnancy-specific risk factors, Obesity as a body mass index of  $\geq 30$  kg/m<sup>2</sup> is associated with an increased risk of stroke even after adjustment for other factors, such as age, physical activity, smoking, alcohol consumption, and conditions, such as hypertension and diabetes mellitus(Katsafanas & Bushnell, 2021).Moreover, Oral contraception may be harmful to women with additional stroke risk factors, such as cigarette smoking (active and passive), and previous thromboembolic history.(Cauldwell et al., 2018)

As well, as the favourable physiologic conditions for clotting described above, there are many other conditions which can predispose women to ischemic stroke while pregnant and in the immediate postpartum period. These conditions range from congenital conditions, infections, and disease states acquired during pregnancy itself. Lifestyle factors have been found to increase the risk of ischemic stroke during pregnancy (Soto-Cámara et al., 2020). Treatment of stroke during pregnancy is based on the current recommendations for non-pregnant stroke patients, assuming the benefit of these treatments is likely higher than the risks. These decisions must be made with the appropriate specialists in stroke and endovascular treatment, as well as high-risk obstetricians/gynaecologists' and most importantly, patient and family preferences. (Ladhani et al., 2018). More important than treatment is raising awareness and optimizing stroke prevention in women is critical to reducing the number of strokes, the personal and societal costs of long-term disability from stroke, and stroke deaths. Prevention plays a critical role in reducing morbidity and mortality related to stroke.

---

**Corresponding Author:** Fatma Aboulkhair Farag  
PhD, RN, Assistant Professor of Maternal and Newborn Health  
Nursing, Faculty of Nursing, Fayoum University- Egypt  
Email:faf01@fayoum.edu.eg

It has been estimated that 50% of strokes are preventable through the control of modifiable risk factors and lifestyle changes (Pothiban et al., 2018). Therefore, the core inconsistency of this research study are highlighted by (Okonkwo et al., 2021), who stated that a greater understanding of perceived risk factors and warning signs for pregnancy-associated stroke would facilitate health interventions aimed at reducing morbidity and mortality from stroke consequently, the study aims to examine the effectiveness of self-instructional module on pregnant women's knowledge and awareness regarding risk factors and warning signs of pregnancy-associated stroke.

#### **Significance of the Study:**

Stroke annually affects 16 to 59 out of every 100,000 women of childbearing age (Elgendy et al., 2020), which amounts to an estimated 180,000 women having ischemic stroke annually in Europe. Apart from severe disabling stroke symptoms, suddenly, these young women face lifelong consequences (Alqwaifly et al., 2020) the limitations that occur in the period of life during which plans are made about starting a family. The difficulties in making these decisions are fueled by a lack of knowledge about the risks of future pregnancy complications after stroke in women (Wu et al., 2020).

The perinatal and early postpartum periods appear to confer the greatest risks. Previous studies have reported wide variability in stroke incidence during pregnancy and the puerperium, likely due to pre-existing pathologies, physiological changes during pregnancy, personal characteristics, and hormonal contraceptive uses and lifestyles. Recently, there have been troubling trends regarding the rising incidence of stroke in younger age groups, the increased prevalence of risk factors in younger adults, and women becoming pregnant at an older age making this a critical time to reassess trends in pregnancy-associated stroke risk (Miller et al., 2016).

Prenatal education is an important component of supporting a healthy pregnancy. Guide risk factors and warning signs as well as maintain healthy lifestyles during pregnancy, help expectant mothers manage stress, eat a healthy diet, avoid harmful practices and situations, learn about warning signs and symptoms that mean something might be threatening their pregnancy, equip them and have the knowledge and awareness to prepare them for safe labour and childbirth. Thus, the current study aims to examine the effectiveness of self-instructional modules on pregnant women's knowledge and awareness regarding risk factors and warning signs of pregnancy-associated stroke.

#### **Aim of the Study:**

The current study aimed to examine the effectiveness of the self-instructional module on pregnant women's knowledge and awareness regarding risk factors and

warning signs of pregnancy-associated stroke. This aim was achieved through the following objectives:

- Assessing the level of women's knowledge and awareness regarding risk factors and warning signs of pregnancy-associated stroke (before intervention).
- Designing and implementing a self-instructional module.
- Evaluating the effectiveness of the self-instructional module on women's knowledge and awareness level regarding risk factors and warning signs of pregnancy-associated stroke (post-intervention)

#### **Research Hypotheses:**

- There will be a significant improvement in pregnant women's knowledge regarding risk factors and warning signs of pregnancy-associated stroke after applying the self-instructional module compared to their pre-intervention level.
- There will be a significant improvement in pregnant women's awareness of warning signs of pregnancy-associated stroke after applying the self-instructional module compared to their pre-intervention level.

## **2 | OPERATIONAL DEFINITION**

### **Pregnancy-Associated Stroke (PAS):**

Stroke during pregnancy and after childbirth often arises from an argumentative interaction between normal physiological changes related to pregnancy, complications of pregnancy or childbirth, and baseline characteristics of the pregnant woman's lifestyle factors. Moreover, unhealthy habits or diseases of a pregnant woman that increase the risk of stroke include drug use (smoking, alcohol, illegal drugs), obesity, diabetes, dyslipidemia, chronic high blood pressure, heart disease, and migraines. and antiphospholipid syndrome. In addition to systemic lupus erythematosus, coagulopathies, certain genetic features (CADASIL sickle cell disease), and cerebrovascular malformations (aneurysms, arteriovenous malformations, and moyamoya disease) (Elgendy et al., 2020; Karjalainen et al., 2019).

More than mentioned above, among demographics, advanced age and African American ethnicity are associated with an increased risk of PAS. Complications of pregnancy and childbirth, such as hyperemesis gravidarum, postpartum haemorrhage and infection, and cesarean delivery, may precipitate ischemic stroke by amplifying coagulation status and fluid, electrolyte, and acid-base disturbances. (Elgendy et al., 2021)

### **Self-Instructional Module:**

It is a set of instructions or information provided by the researcher regarding pregnancy-associated stroke. Arabic written, illustrated, and distributed by the researcher.

### 3 | SUBJECTS & METHODS

#### **Research Design:**

A quasi-experimental design (one group pre- posttest design) was used to achieve the aim of this study. A quasi-experiment is an interventional experimental study used to estimate the causal effect of an intervention on a target population without random allocation. In the pre-and post-test design, the dependent variable is measured once before treatment is implemented, and once after it is implemented.

#### **Research Setting:**

This study was conducted in obstetrics and gynaecology outpatient clinics at Cairo University Teaching Hospital. These clinics specialize in providing maternity care to women from different social backgrounds and cover a wide geographical area of Cairo and Giza Governorate. Starting from 9:00 am to 2:00 pm. This setting was chosen because it is both a university and teaching hospital, and when researchers attended with students during clinical training, they found an increased rate of pregnant women at risk of stroke according to one or multiple risk factors.

#### **Subjects:**

A purposive sample of pregnant women who attended the setting mentioned above for six months was recruited for the study, which was (100) high-risk women. The studied sample was selected according to the following *inclusion criteria*; pregnant and willing to participate in the research, at any trimester, the women who intend to follow and commit to the scheduled antenatal visits, at least able to read and write, at risk for pregnancy-associated stroke (as mentioned in operational definition) and available during the time of the research. *Exclusion criteria*: Normal pregnancy and absence of risk factors.

#### **Tools of Data Collection:**

There were three instruments used for the current study data collection:

##### **Tool (1) A Self-Administered Questionnaire:**

Researchers designed it after reviewing the relevant literature (Bhat et al., 2018a; Pothiban et al., 2018) to assess participants' socio-demographic characteristics, obstetric history, and stroke risk factors. It was written in Arabic. It consisted of three parts: **Part (1)** concerned with women's personal-demographic characteristics as (age, residence, level of education, occupation, income, type of family, and source of information). **Part (2)** covers the women's obstetrical data, it consisted of (gestational age per trimester, parity, living children ...) as well as body mass index (BMI), and **Part (3)** contain stroke associate risk factors and any co-morbidity (medical condition, previous history, lifestyle)

##### **Tool (2) The Stroke Knowledge Questionnaire (SKQ):**

It was developed by researchers based on a literature review (Aldebasi et al., 2017; Pothiban et al., 2018;

Soto-Cámara et al., 2020) to assess stroke knowledge and its sources in Arabic. It consists of 30 questions regarding knowledge of the disease and its complications (6 items), risk factors (9 items), warning signs (6 items) and early management (9 items). Stroke knowledge is assessed through true-false questions (scoring: 1 for the correct answer and 0 for the wrong answer). For example, "Can high blood pressure increase the risk of stroke?" and "Can stroke be prevented by lifestyle modification?" Possible scores range from 0 to 30. The level of stroke knowledge is divided into 3 levels by calculating the total score, where the level of knowledge is poor (<50%) of 0->15, fair (50% to <75%) of 15->22.5, and the good (75% to 100%) score ranged from 22.5-30.

##### **Tool (3) The Stroke Awareness Questionnaire (SAQ):**

It was developed by the researchers based on a literature review (Bakraa et al., 2021; Bhat et al., 2018; Pothiban et al., 2018) in the Arabic language. The SAQ measures awareness of stroke severity and its effects from the participants' perspective. It consists of 14 items, and the content validity was verified by five experts who specialized in neurology, obstetrics, and nursing (two medical professors and three maternity and neonatal health nursing professors). Participants were asked to rate their awareness regarding the severity and impact of the stroke on a 3-point scale ranging from 3 to 1 (3 = agree, 2 = not known, and 1 = disagree). An example would be: "How do you think a stroke might cause abnormal communication?" "The higher the score, the greater the awareness of stroke severity and its effects. Stroke awareness level was divided into 3 levels by calculating the class interval as follows: Poor awareness level (<50%) range from 0-<21, Fair (50% to <75%) score range from 21 -> 31.5, and A good score (75% to 100%) is between 31.5-42.

##### **Validity of the Tools:**

Content validity was verified by five experts who specialized in neurology, obstetrics, and nursing (two medical professors) and (three maternity and neonatal health nursing professors). And according to their opinions; no major modifications were carried out to the content. Cronbach alpha coefficient for the stroke knowledge questionnaire was measured as (0.84), and a Cronbach alpha coefficient for the stroke awareness questionnaire was measured as (0.86).

##### **Administrative and Ethical Considerations:**

To conduct the study, the researchers took approval through official letters containing the objective of the study which were addressed to the Dean of the Faculty of Nursing at Badr University in Cairo. As well as the head of the aforementioned department for permission, and assistance in conducting the study. The researchers explained the purpose of the study to selected pregnant women and took the verbal consent to participate in the study and assured them that they

have the right to withdraw at any time without giving reasons, and all the data used for the purposes of the research are kept strictly confidential.

**Pilot study:**

The pilot study was conducted on 10% of the total duration of the data collected (about three weeks) to test the simplicity, clarity, and applicability of the study tools as well as to estimate the time needed to complete and evaluate the questionnaire. Feasibility of the research process. According to the results of the pilot study, modifications were made such as adding, deleting, or rephrasing some questions. Women participating in the pilot were excluded from the study to avoid contamination of the sample.

**Field Work:**

The following phases were adopted to fulfil the aim of this research. The preparatory phase interviewing and assessment phase, the planning phase, the self-instructional module implementation phase, and the evaluation phase. These phases were carried out from the beginning of September 2020 and completed at the end of February 2021, covering six months. The researchers visited the previously mentioned setting three days/week (Monday, Tuesday, and Wednesday), from 9.00 am to 1.00 pm until the predetermined duration of six months has been completed.

**The Preparatory Phase:** was the first stage of the research, and the researchers carried out a review of relevant local and international literature on various aspects of the research problem (pregnancy-associated stroke). This stage helped the researchers to identify the magnitude and seriousness of the problem and directed the researchers to prepare the required data collection tools.

**Interviewing and assessment phase:** This phase included interviewing each woman in the waiting room of the outpatient clinic. At the beginning of the interview, the researchers greeted the woman, introduced themselves to each woman included in the research, explained the purpose of the research, provided the woman with all information about the research, and take oral consent to participate in the research. Researchers collected data through the administration of the self-administered questionnaire, stroke knowledge assessment questionnaire, and stroke awareness questionnaire to each woman (tools no. 2 and 3 were pretests). The average time for the completion of each woman interview was around (20-30 minutes). The interviewed women/day ranged from 2-3 women. The data obtained during this phase constituted the baseline for further comparison to evaluate the effect of self-instructional modules.

**Planning Phase:** The self-instructional module (SIM) was developed by the researchers, based on reviewing related literature (Kaub & Shen, 2020a, Masne, 2018, 2019; Partial & Of, 2016). The SIM was developed in the form of a printed booklet written in the Arabic language and was illustrated with coloured

pictures to be more clear and more attractive. to satisfy the studied pregnant women's knowledge deficit regarding risk factors and warning signs of pregnancy-associated stroke. It was to go with women's level of understanding and based on the topic of the research. The SIM consists of three parts to raise women's knowledge and awareness regarding risk factors and warning signs of pregnancy-associated stroke. It distributes through education sessions. Different methods of teaching and instructional media were used such as discussion, demonstration, clarification, and brainstorming. Instructional media included video and Power Point presentations containing all content of the sessions.

**Objectives were constructed and included the following:**

**General objective:**

By the end of the self-instructional module sessions, each woman would be able to acquire essential knowledge and awareness regarding risk factors and warning signs of pregnancy-associated stroke

**Specific objectives:**

By the end of the self-instructional module sessions, each woman would be able to: -

- Define pregnancy-associated stroke.
- Identify the time of occurrence.
- List short-term and long-term complications
- Identify risk factors associated with stroke during pregnancy.
- Explain the physiological changes regarding associated risk.
- Identify warning signs of stroke.
- Interact immediately with an emergency situation.
- Adopt a healthy lifestyle to control risk factors.

**Implementation Phase:** This module was implemented through two scheduled sessions. It was conducted in the waiting room of the outpatient clinic immediately after the completion of the assessment phase. Each session took about 30-45 minutes. At the beginning of the first session, the woman was directed with self-instructional module contents. The subsequent session started with feedback about the previous session and the objectives of the new session. At the end of each session, five minutes were devoted to permitting women to ask questions to clarify the session contents and to correct any misunderstanding. Each woman was informed about the time of the next sessions.

**The first session** included a definition of pregnancy-associated stroke, complications, time of occurrence, and physiological changes related to stroke factors.

**The second session** included the risk factors, warning signs, early management, and lifestyle modification of preventable factors. These sessions were repeated for each subgroup of (4-6) women until the predetermined sample size was completed.

**Evaluation phase:** The effectiveness of the self-instructional module was evaluated after implementation. The researcher used the format of the same tool used during the assessment phase (pre - post-test) (tools no.2 and 3).

**Limitations of the study:**

- Some restrictions the researchers faced due to COVID- 19 isolation policy.
- The study sample included just pregnant women and not included post-partum women

**Statistical Analysis**

The data was verified before computer entry. The Social Sciences Statistical Package (SPSS version 22.0) was used for this purpose. Descriptive statistics were used to determine the level of stroke knowledge and awareness regarding disease, risk factors,

warning signs and early management and stroke awareness of all participants. The differences between stroke knowledge mean scores and stroke awareness mean scores (e.g., mean, standard deviation, frequency, and percentages). The correlation coefficient (r) was used to find the correlation between the studied variables (knowledge and awareness). A test of significance (t-test, chi-square) was used to find the difference between the women's knowledge and awareness before and after the intervention. Statistically, a significant difference was considered at a value  $\leq 0.05$ , and a highly statistically significant difference was considered at a p-value  $\leq 0.001$ , while the p-value  $>0.05$  indicates a non-significant difference.

**4 | RESULTS**

**Table (1): Distribution of the Study Participants According to Their Socio-Demographic Characteristics (N= 100).**

Socio-Demographic Characteristics	N	%
<b>Age per year:</b>	<25	30 30.0
	25- <30	34 34.0
	30- <35	19 19.0
	35 or more	17 17.0
	Mean $\pm$ SD	28.12 $\pm$ 6.13
<b>Residence:</b>	Rural	40 40.0
	Urban	60 60.0
<b>Job:</b>	Employee	71 71.0
	Housewife	29 29.0
<b>Education:</b>	Read & write	19 19.0
	Primary Education	27 27.0
	Secondary education	42 42.0
	University education	12 12.0
<b>Monthly Income:</b>	Cover the life cost	33 33.0
	Not cover the life cost	67 67.0
<b>Type Of Family:</b>	Nuclear	43 43.0
	Joint	57 57.0

**Table (1)** Summarizes the participants’ socio-demographic characteristics as the mean age of the studied women is (28.12 $\pm$ 6.13) more than three half (60%) of them were from rural areas and most of them (70%) were employees. Regarding women's education, slightly more than one-quarter of them (27%) read and write while approximately half of

them (42%) had secondary education (diploma) and the minority of them (12%) had a university education. And about two third of them (67%) stated that their monthly income didn’t cover their living cost. And more than half of the participants (57%) live in a joint family.

**Figure (1): Distribution of the Study Participants According to Their Previous Experiences with Pregnancy Associated Stroke (N= 100).**

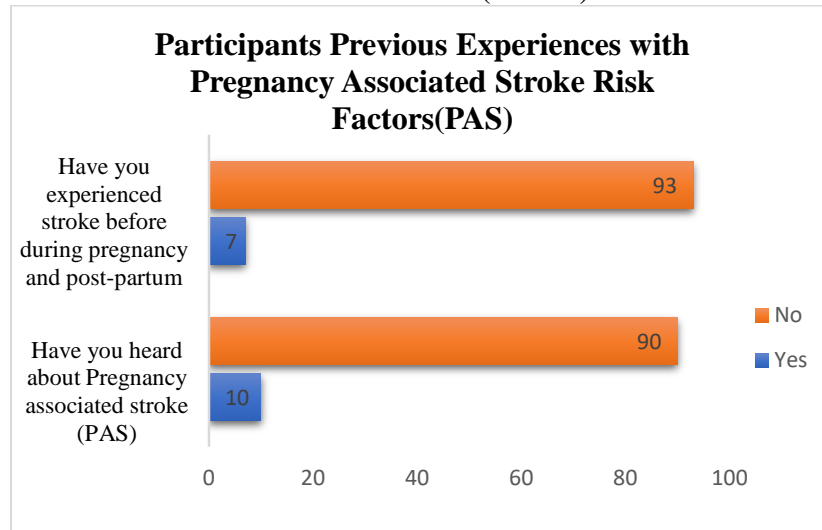


Figure (1) shows that (7%) of participants had past experiences with stroke attacks as well (10%) of the

participants had previous knowledge regarding Pregnancy Associated Stroke (PAS).

**Table (2): Frequency Distribution of the Participants According to Their Obstetric Data and BMI (N=100).**

Obstetric Data and BMI		N	%
Number of Pregnancies:	1- 2	58	58.0
	3-4	24	24.0
	More than 4	18	18.0
Number of Abortion:	There's no abortion	66	66.0
	1-2	20	20.0
	3-4	6	6.0
	More than 4	8	8.0
Number of Deliveries: N = 88	1-2	54	61.4
	3-4	22	25.0
	More than 4	12	13.6
The number of Living Children:	There are no children	12	12.0
	1-2	56	56.0
	3-4	20	20.0
	More than 4	12	12.0
Gestational Age Per (Trimester):	1 <sup>st</sup> Trimester	23	23.0
	2 <sup>nd</sup> Trimester	55	55.0
	3 <sup>rd</sup> Trimester	22	22.0
Pregnancy Type:	Normal	93	93.0
	ART	7	7.0
BMI (Kg/M <sup>2</sup> ):	Under Wt. (BMI < 18 Kg/M <sup>2</sup> )	13	13.0
	Normal Wt. (BMI 18- 24.9 Kg/M <sup>2</sup> )	28	28.0
	Over Wt. (BMI 25 -29.9 Kg/M <sup>2</sup> )	36	36.0
	Obese (BMI > 30 Kg/M <sup>2</sup> )	23	23.0
	Mean ± SD	32.7 ± 3.4 Kg.	

**Table (2)** shows that more than half (58%) of the participants were pregnant 1 to 2 times while less than one-fifth (18%) were pregnant more than 4 times. Regarding the number of miscarriages, two-thirds (66%) had never miscarried while one-fifth (20%) had miscarried 1 to 2 times. Meanwhile, regarding the number of births, nearly two-thirds (61.4%) of women have given birth 1 to 2 times while only (13.6%) have given birth more than 4 times. Regarding the number of surviving children,

more than half (56.0) have one to two children and more than one-tenth (12%) have more than four children. More than fifty per cent (55%) were in their second trimester and most had a normal pregnancy way (93%) and only 7% through assisted reproductive techniques. In addition, the mean± SD of BMI was 32.7 ± 3.4, more than one-third of the sample (36%) BMI was overweight, while more than one-fifth (23%) were obese, and less than one-third (28%) were normal body mass index.

**Figure (2): Distribution of the Study Participants According to Their Sources of knowledge regarding Pregnancy Associated Stroke (N= 100).**

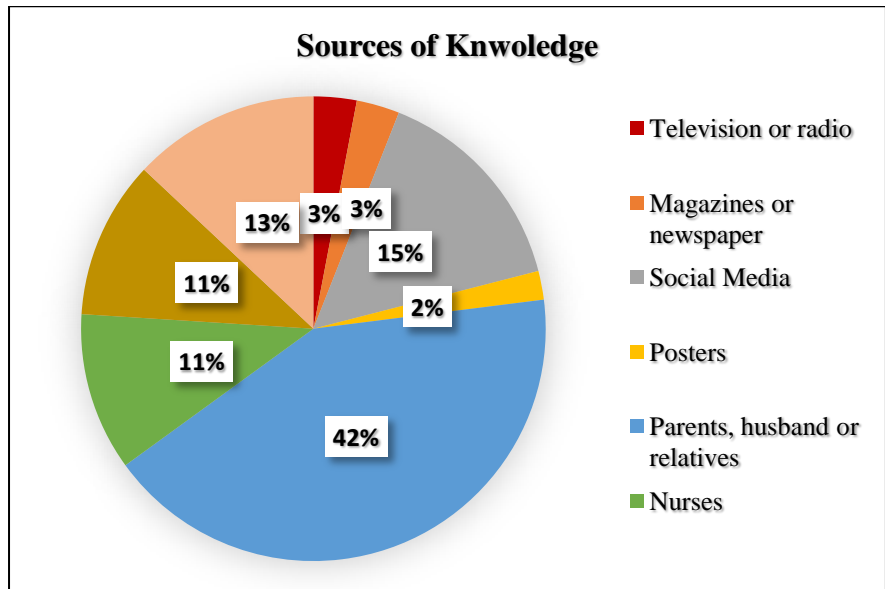


Figure (2): illustrates that about two-fifths of the participants (42) stated that their previous sources of knowledge regarding pregnancy-related stroke were from their parents, spouses, or relatives, and only

about one-tenth (11%) were from nurses or doctors. While the minority (2%) were from posters in the clinic.

**Figure (3): Distribution of Study Participants According to Their Number of Pregnancy Associated Stroke Risk Factors (N = 100).**

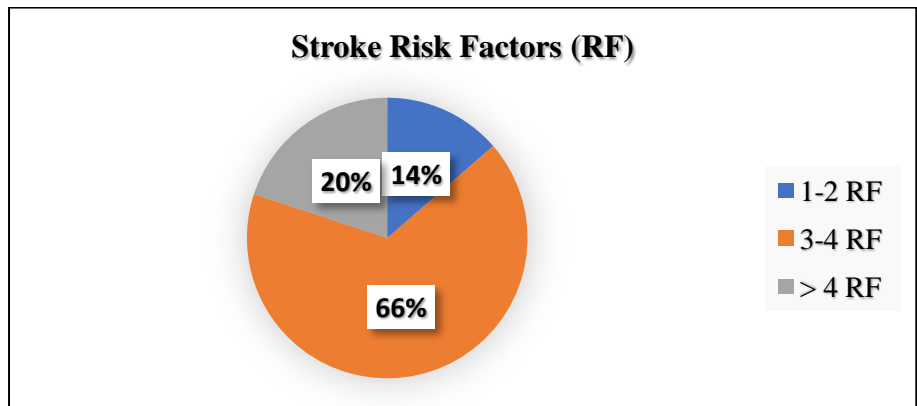
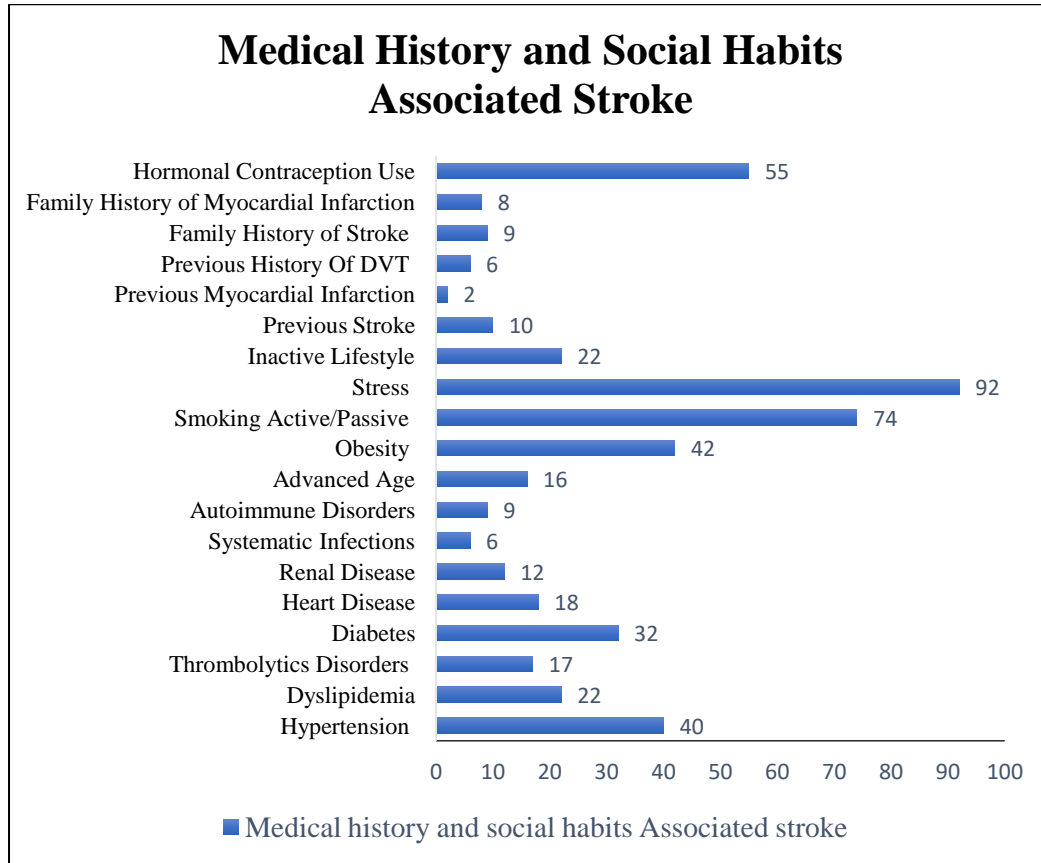


Figure (3) highlights the number of pregnancy-related stroke risk factors among the participants. As nearly two-thirds (66%) had three to four risk factors for

stroke, while a fifth (20) had more than four risks. whilst (14%) have one or two risk factors



**Figure (4): The Distribution of Study Participants According to Their Pregnancy Associated Stroke Risk Factors (N = 100).**

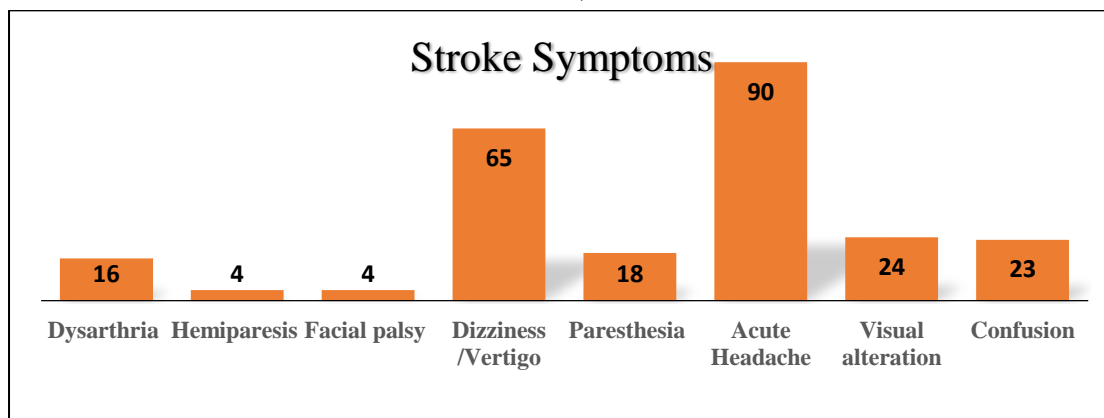


\*Note: Multiple Responses

Figure (4): Emphasizes pregnancy-related stroke risk factors among participants. Life stressors were the top factor mentioned by the majority (more than 90%). The highest proportions among the risk factors were smoking (active and passive), hormonal

contraceptives, obesity, and hypertension (74%, 55%, 42%, and 40%), respectively. While two of the participants stated that they had a previous history of myocardial infarction.

**Figure (5): Distribution of Stroke Symptoms among Study Participants According to Their Exposure (n = 100)**



\*Note: Multiple Responses

Figure (5): lightens distribution of stroke symptoms among study participants according to their exposure. Acute headache, dizziness and vertigo were the

highest rates of symptoms (90% and 65%), respectively, while the lowest were hemiparesis and facial palsy 4% for both.

**Table (3): Comparison of Mean Knowledge Scores Before and After Using the Self-Instructional Module Among Study Participants (N = 100)**

Knowledge Items	Before Using SIM Mean± SD	After Using SIM Mean± SD	X <sup>2</sup>	P Value
Pregnancy Associated Stroke (0-6)	1.40±0.96	5.20±1.16	32.78	0.000**
Risk Factors (0-9)	1.80±0.76	7.80±1.01	24.27	0.000**
Warning Signs (0-6)	1.73±1.25	5.03±1.11	34.70	0.000**
Early Management (0-9)	0.77±0.25	7.53±0.83	30.94	0.000**
Overall, Knowledge Scores (0-30)	5.70±2.35	25.56±4.11	46.34	0.000**

\*\*P high statistically significant if < 0.001

**Table (3)** illuminates the comparison of mean knowledge scores before and after using the self-instructional module among study participants. There was a highly statistically significant difference (p=0.000) representing an increase in overall knowledge scores before using the self-instructional

module regarding pregnancy-Associated stroke such as disease definition, pathology, complications, risk factors, warning signs as well as early management, compared with the after the intervention. And the means knowledge scores were (5.70 ± 2.35) and (25.56 ± 4.11), respectively.

**Table (4): Distribution of The Study Group According to Their Total Knowledge and Awareness Level Regarding Pregnancy Associated Stroke Before and After Using Self Learning Module (N=100).**

Items	Before SIM	Using	After Using SIM		X <sup>2</sup>	P-value
	N	%	N	%		
<b>Knowledge level:</b>						
Good	8	8.0	79	79.0	43.23	<0.001*
Average	22	22.0	14	14.0		
Poor	70	70.0	7	7.0		
<b>Awareness level</b>						
Good	6	6.0	82	82.0	38.37	<0.001*
Average	19	19.0	14	14.0		
Poor	75	75.0	4	4.0		

<0.001\* means highly statistically significant.

**Table (4)** shows a comparison of the total levels of knowledge and awareness before and after instruction among the participants regarding risk factors and warning signs associated with pregnancy-related stroke. The results revealed statistically significant differences showing that more than two-thirds (70%) of the participants had a poor level of knowledge before the intervention compared to about four-fifths

(79%) of them had good knowledge after the intervention (p < 0.001). In addition, with regard to their level of awareness, three-quarters of the participants (75%) had a poor level of awareness before the intervention compared to the vast majority of them (82% had a good level after the intervention (P < 0.001).

**Table 5: Correlation between Women's Total Satisfactory Knowledge and Their Awareness.**

Items	Total Knowledge			
	Before Using SIM		After Using SIM	
	r	P-value	r	P-value
Level of Awareness	0.263	<0.001*	0.423	<0.001*

<0.001\* means highly statistically significant.

**Table (5)** represents a highly significant positive correlation between women's satisfactory knowledge and their satisfactory awareness level regarding pregnancy-associated stroke risk after using the self-learning module (p <0.001). The more knowledge women have, the higher their awareness of the warning signs of stroke risk factors.

## 5 | DISCUSSION

Stroke is a leading cause of death and disability worldwide. Knowledge and awareness of stroke risk factors and warning signs might improve its prevention and ensure timely activation of emergency management services and access to thrombolysis. A self-Instructional Module has been held to assess its impact on the knowledge and awareness of high-risk

pregnant women regarding risk factors and warning signs of Pregnancy-associated stroke.

Several studies have been conducted to assess stroke awareness among the general population. Few studies have been done on pregnancy-related stroke. High-risk pregnant women revealed insufficient knowledge regarding various aspects of stroke risk factors, causes, complications, and warning signs as well as early management and preventable lifestyle modification. The current study aimed to examine the effectiveness of the self-instructional module on pregnant women's knowledge and awareness regarding risk factors and warning signs of pregnancy-associated stroke. The findings of the study have been discussed with references of the objectives, the framework, and the hypotheses of the study.

As regards to socio-demographic characteristics of the current study findings represented that the mean age of the studied women is  $(28.12 \pm 6.13)$  more than three half of them were from rural areas and most of them were employees. Regarding women's education, approximately half of them had secondary education (diploma) and the minority of them had a university education. And about two third of them stated that their monthly income didn't cover their living cost. And more than half of the participants live in a joint family.

The researchers concluded that some of the same sociodemographic characteristics may put pregnant women at greater risk for PAS because some of them were pregnant at an advanced age over the age of 35. Moreover, about two-thirds of them reported that their monthly income did not fit to cover the costs of the family. And more than half of them live in a joint family, which may reflect some of the problems of physical stress and financial burden, which are factors associated with stroke in general, and especially with pregnancy.

the researchers' opinions are in the line with (Cauldwell et al., 2018), in their study regarding the management of stroke and pregnancy, who stated that a low level of education has been associated with a poor level of knowledge as well as the residence, socioeconomic status also considering some factors for incidence of stroke. As well they found that being younger as well a low socioeconomic level were risk factors for the lack of awareness about stroke risk factors.

Concerning the participants' past experience regarding PAS, the results of the study revealed that a minority of the participants had no prior stroke information even though about fifty participants had multiple risk factors, and some had previously had a stroke. Their parents were the main source of knowledge for about two-fifths of the participants, and only about one-tenth were nurses or doctors. While a few of them were sourced from the poster in the clinic.

This reflects the lack of a role for the healthcare team and health institutions in stroke awareness. This is the same line with the (Masne, 2019) in their study regarding the effectiveness of self-instructional modules on knowledge regarding the prevention of stroke among adults in a selected rural area.

Regarding the participants' obstetric data and BMI, the results of the study revealed that about half of the participants were pregnant more than once, less than one-fifth were pregnant more than 4 times, and almost a third had miscarriages. And more than ten of them gave birth more than 4 times. In addition, the mean  $\pm$  SD of BMI was  $32.7 \pm 3.4$ , and less than one-third had a normal BMI. Regarding the number of pregnancy-related stroke risk factors among the participants, the vast majority had 2 or more risk factors.

The current research findings on the above obstetric data and BMI range were important data putting pregnant women at risk of stroke. Thus, making the researchers focus and stress the importance of the guidance. Furthermore, pregnant women with their important data were more committed to using the self-education booklet. This finding is accepted by (Liu et al., 2019) in their study regarding stroke and cerebrovascular disease in pregnancy: incidence, temporal trends, and risk factors.

Regarding pregnancy-associated stroke risk factors among participants. The study findings revealed that life stressors were the first factor mentioned by the majority. The highest proportions among the risk factors were smoking (active and passive), hormonal contraceptives as the preferred methods to be used by women after childbirth, obesity, and high blood pressure, respectively.

The results of the study are consistent with (Abdelhamid et al., 2015; Miller et al., 2020) who stated in their study regarding risk factors for pregnancy-related stroke that the most common risk factors for stroke were smoking, hypertension, and dyslipidemia. In addition to (Swartz et al., 2017a) in their study of the incidence of pregnancy-related stroke, a systematic review and meta-analysis found that "smoking" was listed as the most common risk factor for stroke in the study also that high blood pressure was the most common risk factor, frequently identified risk of stroke.

In contrast (Duque et al., 2015) mentioned that cardiovascular disease is the most commonly mentioned factor in their study. Meanwhile, lifestyle-related factors, such as overweight/obesity and physical inactivity, despite their pervasiveness and increment of the stroke risk, are identified only in a limited number of cases. Only a small proportion of patients are able to identify their own risk factors, which may lead to the continuation of an unhealthy lifestyle or poor medication compliance.

Concerning the results of the current study regarding stroke symptoms among study participants according

to their exposure, severe headache, dizziness, and vertigo had the highest symptom rates, respectively. The last of them were hemi paresis and facial palsy. The researchers found that some stroke symptoms are similar to the physiological changes of pregnancy and minor discomforts, so it will be difficult to identify what makes women at risk, so awareness of symptoms as well as risk factors is very important to determine an early diagnosis and early decision on it for urgent treatment.

The above results are inconsistent with the results of the study conducted by (Pothiban et al., 2018) they mentioned that "Blurred and double vision or loss of vision in one eye" was the most common stroke warning sign listed by respondents. A lower proportion of respondents recognized "weakness and paralysis on one side of the body" as a stroke warning sign.

In contrast, in a study of patients with acute stroke, (Hickey et al., 2012) reported that the most commonly documented stroke warning sign was "weakness." In the present study, more respondents listed "chest pain or chest tightness" as a stroke warning sign than listed unilateral weakness or paralysis.

As regards the comparison of knowledge mean scores before and after using the self-instructional module among study participants were  $(5.70 \pm 2.35)$  and  $(25.56 \pm 4.11)$ , respectively. There was a highly statistically significant difference ( $p=0.000$ ) representing an increase in overall knowledge scores before using the self-instructional module regarding pregnancy-Associated stroke such as disease definition, pathology, complications, risk factors, warning signs as well as early management, compared with after intervention.

The researchers found that the progress in the level of knowledge related to the availability of the booklet with the participants, as well as the discussion of the risk factors and their multiplicity to be more than four combined they become more aware and fearful about their health. Furthermore, when the participants determined the number of risks, they were exposed to by themselves and in partnership with the discussion group, they made them adhere to the implementation of instructions and guidelines.

The results of the current study agree with (Bedier et al., 2018) who stated that in their study of the effect of the nursing education program on knowledge among patients at risk of stroke, there was a statistically significant improvement immediately after implementing the program. The sum of the patients' knowledge score in relation to all elements of stroke. This may be due to the effectiveness of the stroke health education program by using different methods of teaching including lecture and discussion (interactive lecture) and using suitable teaching aids which were in the form of a leaflet (booklet) prepared by the researcher to provide information for patients

in a simple way using simple language and illustrative pictures.

With regard to the level of awareness toward stroke symptoms, risk factors, and early management strategies. the current study revealed that three-quarters of the participants had a poor level of awareness before the intervention compared to the vast majority of them who had a good level after the intervention ( $P < 0.001$ ). In addition, a highly significant positive correlation between women's good knowledge and their good awareness level regarding pregnancy-associated stroke risk ( $p < 0.001$ ). The researchers explained that due to more knowledge women have, the higher their awareness of the warning signs of stroke risk factors.

In agreement with (Alqwaifly et al., 2020; Farooq & Khyber, 2016) in their studies regarding the level of awareness after the health teaching session. They found that participant awareness level after education was rising, and the participants identified a lot of issues associated with stroke during pregnancy and how to control it. As improving their daily living activities, controlling their weight, and maintaining body mass index, identifying risk factors and warning signs to start early management. Furthermore, controlling co-morbidities and using hormonal contraception with prescription. Moreover, lowering the level of cholesterol in the body.

## 6 | CONCLUSION

Based on the findings of the present study, it can be concluded that a big proportion of pregnant women are at risk for pregnancy-associated stroke. And a big proportion of pregnant women at risk of pregnancy-associated stroke are not aware of the sign, symptoms and risk factors associated with stroke. Finally, it was clear that the self-instructional module had succeeded in inducing statistically significant improvements in pregnant women's knowledge and awareness about pregnancy-associated stroke which meant that the research hypothesis was fulfilled.

### **Recommendations:**

Based on the most important findings of this study, the following recommendations are suggested:

- Regular continuing education programs should be conducted in antenatal care units regarding pregnancy-related stroke risk factors, warning signs, and how to maintain healthy lifestyles during pregnancy.
- Healthcare workers, especially nurses and obstetricians, should raise awareness for preventing pregnancy-associated stroke risk

### **Further Study:**

- Replication of the current study on a large probability sample from different geographical areas to achieve more generalized results.
- Replication of the current study to assess the impact of an education program on the incidence of stroke during post-partum.

- The standardized stroke risk screening tool should be used for identifying pregnant and post-partum at risk for Pregnancy Associated Stroke in obstetrics Units.

## 7 | REFERENCES

- [1]. Bedier A A, Sheir I, Shahin ES & Abd El-Reheem A, (2018): Effect of Nursing Educational Program on knowledge Among Patients at Risk for Stroke. In *Port Said Scientific Journal of Nursing* (Vol. 5, Issue 1).
- [2]. Aldebasi, K. A., Alamri, N. M., & Alqahtani, A. M. (2017): Knowledge, Attitude and Practice towards Stroke Risk Factors and Warning Symptoms in Saudi Arabia, 2017. *The Egyptian Journal of Hospital Medicine*, 69(3), 2082–2087. <https://doi.org/10.12816/0041063>
- [3]. Alqwaifly, M., Alghasham, G., Alkadi, S., & Aloyaidi, G. (2020): Awareness of stroke risk factors, warning symptoms, and significance of acute management and prevention in Qassim, Saudi Arabia. *International Journal of Medicine in Developing Countries*, 2158–2163. <https://doi.org/10.24911/ijmdc.51-1602076831>
- [4]. Bakraa, R., Aldhaheeri, R., Barashid, M., Benafeef, S., Alzahrani, M., Bajaba, R., Alshehri, S., & Alshibani, M. (2021): Stroke risk factor awareness among populations in Saudi Arabia. *International Journal of General Medicine*, 14, 4177–4182. <https://doi.org/10.2147/IJGM.S325568>
- [5]. Ban, L., Sprigg, N., Sultan, A. A., Nelson-Piercy, C., Bath, P. M., Ludvigsson, J. F., Stephansson, O., & Tata, L. J. (2017): Incidence of First Stroke in Pregnant and Nonpregnant Women of Childbearing Age: A Population-Based Cohort Study From England. *Journal of the American Heart Association*, 6(4). <https://doi.org/10.1161/JAHA.116.004601>
- [6]. Bhat, A. B., Ahmed, K. I., Sharna, R. N., & Barman, S. (2018): *Knowledge , Attitude and Practice Regarding Stroke amongst the Close Relatives of Stroke Victims at a Tertiary Care Hospital in Bangladesh. September 2016.* <https://doi.org/10.13189/ijcc.2016.040302>
- [7]. Cauldwell, M., Rudd, A., & Nelson-Piercy, C. (2018): Management of stroke and pregnancy. In *European Stroke Journal* (Vol. 3, Issue 3, pp. 227–236). SAGE Publications Ltd. <https://doi.org/10.1177/2396987318769547>
- [8]. Duque, A. S., Fernandes, L., Correia, A. F., Calvino, I., Cardoso, G., Pinto, M., Freitas, P., Silvestre, J., Batalha, V., & Campos, L. (2015): Awareness Of Stroke Risk Factors And Warning Signs And Attitude To Acute Stroke. *International Archives of Medicine*. <https://doi.org/10.3823/1794>
- [9]. Elgendy, I. Y., Bukhari, S., Barakat, A. F., Pepine, C. J., Lindley, K. J., & Miller, E. C. (2021): Maternal Stroke: A Call for Action. In *Circulation* (Vol. 143, Issue 7, pp. 727–738). Lippincott Williams and Wilkins. <https://doi.org/10.1161/CIRCULATIONAHA.120.051460>
- [10]. Elgendy, I. Y., Gad, M. M., Mahmoud, A. N., Keeley, E. C., & Pepine, C. J. (2020): Acute Stroke During Pregnancy and Puerperium. *Journal of the American College of Cardiology*, 75(2), 180–190. <https://doi.org/10.1016/j.jacc.2019.10.056>
- [11]. Elsaid, F. M., Ahmed, M. H., El-Abedin, M., & Abdel-Azzizkhayat, I. (2021): Effect of Implementation of Teaching Program on Pregnancy Outcome among Primipara Women Suffering from Pregnancy Induced Hypertension. In *Tanta Scientific Nursing Journal* (Vol. 21, Issue 2).
- [12]. Farooq, N., & Khyber, D. (2016): Pakistan Journal of Neurological Sciences (PJNS) Awareness about the signs, symptoms and the risk factors of stroke in patients with stroke: a multicentre study AWARENESS ABOUT THE SIGNS, SYMPTOMS AND THE RISK FACTORS OF STROKE IN PATIENTS WITH STROKE: A MULTICENTRE STUDY. In *Pakistan Journal of Neurological Sciences (PJNS)* (Vol. 11, Issue 3). <http://ecommons.aku.edu/pjns/vol11/iss3/9>
- [13]. Hassan, E. M., Aboufotouh, A. M., Saleh, R. N., Yehia, Y. G., & Elghany, A. (2020): *Hospital based study in assessment of risk factors of stroke in young adults .31(2).*
- [14]. Hickey, A., Holly, D., Mcgee, H., Conroy, R., & Shelley, E. (2012): *Knowledge of stroke risk factors and warning signs in Ireland: development and application of the Stroke Awareness Questionnaire ( SAQ ). 7(June), 298–306.* <https://doi.org/10.1111/j.1747-4949.2011.00698.x>
- [15]. Karjalainen, L., Tikkanen, M., Rantanen, K., Laivuori, H., Gissler, M., & Ijäs, P. (2019): *Pregnancy-associated stroke – a systematic review of subsequent pregnancies and maternal health. 1–10.*
- [16]. Katsafanas, C., & Bushnell, C. (2022): Pregnancy and stroke risk in women. *Neurobiology of Disease*, 169(September 2021), 105735. <https://doi.org/10.1016/j.nbd.2022.105735>
- [17]. Kaub, L., & Shen, Q. (2020): Evaluation of the effectiveness of inpatient stroke education for the transition from hospital to primary care offices: An education needs assessment.
- [18]. Khalid, A. S., Hadbavna, A., Williams, D., & Byrne, B. (2020): A review of stroke in pregnancy: incidence, investigations and management. *The Obstetrician & Gynaecologist*, 22(1), 21–33. <https://doi.org/10.1111/tog.12624>

- [19]. Ladhani, N. N. N., Swartz, R. H., Foley, N., Nerenberg, K., Smith, E. E., Gubitz, G., Dowlatshahi, D., Potts, J., Ray, J. G., Barrett, J., Bushnell, C., Bal, S., Chan, W. S., Chari, R., el Amrani, M., Gandhi, S., Hill, M. D., James, A., Jeerakathil, T., ... Lindsay, M. P. (2018): Canadian Stroke Best Practice Consensus Statement: Acute Stroke Management during pregnancy. *International Journal of Stroke*, 13(7), 743–758. <https://doi.org/10.1177/1747493018786617>
- [20]. Liu, S., Chan, W. S., Ray, J. G., Kramer, M. S., Joseph, K. S., Arbour, L., Auger, N., Darling, L., Evans, J., Little, J., Lee, L., McDonald, S., Moore, A., Murphy, P., Sauve, R., Scott, H., Shah, P., & van den Hof, M. (2019): Stroke and Cerebrovascular Disease in Pregnancy: Incidence, Temporal Trends, and Risk Factors. *Stroke*, 50(1), 13–20. <https://doi.org/10.1161/STROKEAHA.118.023118>
- [21]. Masne, S. (2018): Effectiveness of Self-Instructional Module on Knowledge Regarding Prevention of Stroke among Adults in Selected Rural Area. *International Journal of Science and Research*. <https://doi.org/10.21275/ART20194907>
- [22]. Masne, S. (2019): *Effectiveness of Self-Instructional Module on Knowledge Regarding Prevention of Stroke among Adults in Selected Rural Area*. 8(1), 2056–2060.
- [23]. Miller, E. C., Gatollari, H. J., Too, G., Boehme, A. K., Leffert, L., Marshall, R. S., Elkind, M. S. V., & Willey, J. Z. (2017): Risk Factors for Pregnancy-Associated Stroke in Women with Preeclampsia. *Stroke*, 48(7), 1752–1759. <https://doi.org/10.1161/STROKEAHA.117.017374>
- [24]. Miller, E. C., Yaghi, S., Boehme, A. K., Willey, J. Z., Elkind, M. S. V., & Marshall, R. S. (2016): Mechanisms and outcomes of stroke during pregnancy and the postpartum period. *Neurology: Clinical Practice*, 6(1), 29–39. <https://doi.org/10.1212/CPJ.0000000000000214>
- [25]. Okonkwo, U. P., Uzuh, F. N., Nwankwo, M. J., Okoye, E. C., Ummuna, J. O., Igwe, E. S., Maduagwu, S. M., Ani, K. U., Akobundu, U. N., & Nwanne, C. A. (2021): Awareness of the risk factors of stroke among non-teaching staff of the Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria. *Bulletin of Faculty of Physical Therapy*, 26(1). <https://doi.org/10.1186/s43161-021-00057-5>
- [26]. Partial, I. N., & Of, F. (2016). Effectiveness of self-instructional module on knowledge regarding prevention of stroke among hypertensive patients in a selected hospital at modular direct effectiveness of self-instructional module on knowledge regarding prevention of stroke among HY. *April*, 1–129.
- [27]. Pothiban, L., Khampolsiri, T., & Srirat, C. (2018): *Knowledge and Awareness of Stroke Impacts among Northern Thai Population*. *Pacific Rim Int J Nurs Res*, 22(3), 212–222.
- [28]. Soto-Cámara, R., González-Bernal, J. J., González-Santos, J., Aguilar-Parra, J. M., Trigueros, R., & López-Liria, R. (2020): Knowledge on signs and risk factors in stroke patients. *Journal of Clinical Medicine*, 9(8), 1–14. <https://doi.org/10.3390/jcm9082557>
- [29]. Swartz, R. H., Cayley, M. L., Foley, N., Ladhani, N. N. N., Leffert, L., Bushnell, C., McClure, J. A., & Lindsay, M. P. (2017): The incidence of pregnancy-related stroke: A systematic review and meta-analysis. In *International Journal of Stroke* (Vol. 12, Issue 7, pp. 687–697). SAGE Publications Inc. <https://doi.org/10.1177/1747493017723271>
- [30]. Wu, P., Jordan, K. P., Chew-Graham, C. A., Coutinho, T., Lundberg, G. P., Park, K. E., Chappell, L. C., Myint, P. K., Maas, A. H. E. M., & Mamas, M. A. (2020): Temporal trends in pregnancy-associated stroke and its outcomes among women with hypertensive disorders of pregnancy. *Journal of the American Heart Association*, 9(15). <https://doi.org/10.1161/JAHA.120.01618>