DISCUSSION

Traumatic brain injury (TBI) is the leading cause of death and disability after head trauma. [3] Central nervous system trauma accounts for almost half of all trauma deaths examined post-mortem in population-based analyses or following trauma center admission.[97] it is more common in males and young age (<40 years).[98] Head injuries could be due to road traffic accidents (RTA), falling from height(FFH), sport injuries, and violence.[99]

Brain injuries can be classified according to GCS into mild, moderate, and severe categories. The Glasgow Coma Score (GCS) is the most commonly used system for classifying TBI severity. It grades a person's level of consciousness on a scale of 3–15 based on verbal, motor, and eye-opening reactions to stimuli. It is generally agreed that a TBI with a GCS of 13 or above is mild, 9–12 is moderate, and 8 or below is severe. [11]

Resistin belongs to a novel family of cysteine-rich proteins called resistin-like molecule or found in inflammatory zones proteins. [65] Resistin is expressed primarily in inflammatory cells, especially macrophages, and it has been shown to be involved in inflammatory processes [66]. Some proinflammatory agents such as; tumour necrosis factor-α, interleukin-6 and lipopolysaccharide can regulate resistin gene expression. [73] Moreover, resistin is proposed as an inflammatory marker in human atherosclerosis and rheumatoid arthritis. [77]

Recently, it is evidenced that resistin could be produced by the brain and pituitary gland.[90] Furthermore, resistin mRNA was increased in the cortex of hypoxic, ischemic and traumatic animal brain.[91-92] In the patients with ischemic stroke, high plasma resistin level has been associated with higher mortality and disability.[93] Recently, it was reported that high levels of resistin are present in the peripheral blood of patients with intracerebral hemorrhage and this was associated with poor functional outcome.[94] These findings suggest that resistin could contribute to the prognosis of patients with brain injury. [94]

The aim of this work was to evaluate the role of resistin as a prognostic marker in severe TBI patients.

The study was carried out on 48 adult male and female patients, who were admitted to the Critical Care Medicine Departments in Alexandria Main University Hospital with the diagnosis of severe traumatic brain injury (GCS 8 or less).

The patients were classified into two groups:

- **Group I:** Including 17 patients with favorable outcome (GOS 4, 5).
- **Group II:** Including 31 patients with unfavorable outcome (GOS 1, 2, 3).

In the present study, Group I and Group II were homogeneous in terms of demographic characteristics with no statistically significant difference between them regarding age and gender (p=0.389, and p=1.000, respectively). The highest frequency of incidence of severe traumatic brain injury in this study was among young adult males.

In agreement with our study, Chelly et al[100] during their study on prognosis of traumatic head injury they found that the mean age for patients in the studied group was 36 ± 17 years, in a study conducted over a 3-year period (1997-1999) involved 437 adult patients with traumatic brain injury also they found that 90% of the studied patients were males (393) and only 10% (44) were females.[100]

Also in addition, Leon-Carrion et al [101] during their study on citicoline brain injury treatment, they found that the highest frequency of incidence of severe traumatic brain injury was among young adult males.

In the present study, there was no statistically significant difference between Group I and Group II regarding cause of trauma (p=0.515).

RTA was the most common cause of severe traumatic brain injury in both groups followed by FFH then Assault. In Group I they account for 10 (58.8%), 5 (29.4%), 2 (11.8%), respectively, while they account for 23 (74.2%), 5 (16.1%), 3 (9.7%), respectively in Group II.

Similar to the present study, Borkar et al [102] during their study on risk factors of severe traumatic head injury in the elderly, they found that the most common mode of injury was road traffic accident (RTA) in 72%, followed by fall from height in 25% and assault in 3%.

In the present study, there was a significant difference between group I and group II regarding CT- brain findings on admission, group II showed more hazardous findings on CT- brain than group I, also there was a significant difference between group I and group II regarding CT- brain findings after 14 days. This shows the prognostic value of CT- brain in TBI.

Similar to the present study, Wintermark et al [103] during their study on prognostic value of CT- brain in patients with severe head trauma they found that CT- brain in patients with severe head trauma provides independent prognostic information regarding functional outcome.

In the present study, the mean GCS on admission was significantly higher in group I than group II ($p<0.001$). Also, the mean GCS on day 14^{th} was significantly higher in group I than group II ($p<0.001$).

Similar to our study, Farahvar et al [104] during their study on increased mortality in patients with severe traumatic brain injury treated without intracranial pressure monitoring, they found that GCS was associated with the 2-week mortality.

In contrast to the present study, Balestreri et al [105] during their study on predictive value of Glasgow coma scale after brain trauma, they suggested that there was a reduction in the power of the GCS score as a predictor of outcome after traumatic brain injury. This can be explained as their study was a retrospective one which was done on large sample size (484 head injured patients) over a long period of time (between 1992 and 2001).

Also, Lieh et al [106] during their study on the limitations of the Glasgow Coma Scale in predicting outcome in children with traumatic brain injury, they found that a low Glasgow Coma Scale score does not always accurately predict the outcome of severe

traumatic brain injury. This can be explained by different category of patients in this study which was carried on children.

In the present study, we use GOS to measure the outcome of the patients and classify them into two groups:

- **Group I:** Including 17 patients with favorable outcome (GOS 4, 5).
- **Group II:** Including 31 patients with unfavorable outcome (GOS 1, 2, 3).

Similar to the present study, Williams et al [107] during their study on prognostication in severe traumatic brain injury in adults, they found that GOS has a good prognostic value in patients with severe traumatic brain injury.

In contrast to our study, Jourdan et al [108] during their study on the predictive value of Glasgow Outcome Scale in severe Traumatic Brain Injury (TBI) patients, they found that early assessment of disability using GOS by critical care practitioners was a poor predictor of outcome for severe TBI patients. This can be explained by larger sample size (504 patients) of their study, while our study was carried on smaller sample size (48 patients).

In the present study, the mean plasma resistin level was significantly higher in group II than group I on admission ($p=0.002$). Also the Mean plasma resistin level was higher in group II than group I on 3rd day ($p<0.001$).

Similar to the present study, Shen et al [109] during their study on plasma resistin levels in patients with severe traumatic brain injury, they found that plasma resistin level may represent a novel biomarker for predicting clinical outcomes of severe traumatic brain injury.

In the present study, the mean plasma resistin level was significantly higher on admission than on 3rd day in both groups ($p<0.001$).

Similar to the present study, Dong et al [94] during their study on resistin and its association with mortality in patients with traumatic brain injury, they found that the plasma resistin level increased during the first 6-hour period immediately after TBI, peaked within 24 hours, plateaued at day 2 and decreased gradually thereafter.

In the present study, there was significant inverse correlation between the resistin level on 1st day, 3rd day and GCS, as resistin level increased GCS decreased ($p<0.001$).

Similar to the present study, Liang et al [110] during their study on correlation of plasma resistin level and severity of traumatic brain injury, they found that there was a significant correlation emerged between GCS score and plasma resistin level ($p<0.001$).

In the present study, there was a significant inverse correlation between the resistin level on 1st day, 3rd day and GOS, as resistin level increased GOS decreased. This indicate that resistin plasma level has good correlation with the outcome of severe TBI.

Similar to the present study, Xin et al [111] during their study on relationship of Plasma Resistin Concentration with Prognosis of Patients with Traumatic Brain Injury,

they found that there was a significant correlation emerged between GOS score and plasma resistin level.

In the present study, Receiver operating characteristic (ROC) curves were used to describe the prognostic values of resitin, the AUCs for resistin on admission calculated from the ROC curves were 0.862 ($p<0.001$) and the best prognostic cutoff point for resistin on admission was 31 ng/ml: at this level, sensitivity and specificity were 90.32 percent and 83.59percent, respectively.

Similar to the present study, Dong et al [(94)] during their study on resistin and its association with mortality in patients with traumatic brain injury, they found that the AUC calculated from the ROC was 0.854 ($p=0.001$). The cutoff point for resistin was 30.8 ng/ml: at this level, sensitivity and specificity were 84.6 percent and 75.00 percent, respectively.

SUMMARY

Traumatic brain injury (TBI) is the leading cause of death and disability after head trauma. Central nervous system trauma accounts for almost half of all trauma deaths examined post-mortem in population-based analyses or following trauma center admission, it is more common in males and young age (<40 years). Head injuries could be due to road traffic accidents (RTA), falling from height (FFH), sport injuries, and violence.

Resistin belongs to a novel family of cysteine-rich proteins. resistin is expressed primarily in inflammatory cells, especially macrophages and it has been shown to be involved in inflammatory processes. Moreover, resistin is proposed as an inflammatory marker in human atherosclerosis and rheumatoid arthritis.

Recently, it was reported that high levels of resistin are present in the peripheral blood of patients with intracerebral hemorrhage and this was associated with poor functional outcome. These findings suggest that resistin could contribute to the prognosis of patients with brain injury.

The aim of this work was to evaluate the role of resistin as a prognostic marker in severe TBI patients.

The study was carried out on 48 adult male and female patients, who were admitted to the Critical Care Medicine Departments in Alexandria Main University Hospital with the diagnosis of severe traumatic brain injury (GCS 8 or less).

The patients were classified into two groups:

- **Group I:** Including 17 patients with favorable outcome (GOS 4, 5).
- **Group II:** Including 31 patients with unfavorable outcome (GOS 1, 2, 3).

Exclusion criteria were: (1) Patients aged less than 18 years or more than 65 years; (2) Pregnant females; (3) Poly traumatized patients; (4) Co-morbidities: uncontrolled hypertension or hepatic and renal failure; (5) Patients requiring surgical interventions (extradural hematoma, subdural hematoma, intracerebral hemorrhage, skull fractures).

Group I and Group II were homogeneous in terms of demographic characteristics with no statistically significant difference between them regarding age and gender. Also there was no statistically significant difference between Group I and Group II regarding cause of trauma.

There was a significant difference between group I and group II regarding CT- brain findings on admission, group II showed more hazardous findings on CT- brain than group I, also there was a significant difference between group I and group II regarding CT- brain findings after 14 days. This shows the prognostic value of CT- brain in TBI.

The mean GCS on admission was significantly higher in group I than group II. Also, the mean GCS on day 14^{th} was significantly higher in group I than group II.

The mean plasma resistin level was significantly higher in group II than group I on admission. Also the Mean plasma resistin level was higher in group II than group I on 3rd day. There was significant inverse correlation between the resistin level on 1st day, 3rd day and GCS, as resistin level increased GCS decreased. Also, there was a significant inverse Correlation between the resistin level on 1st day, 3rd day and GOS, as resistin level increased GOS decreased.

The mean plasma resistin level was significantly higher in first day than in third day in both groups.

The receiver operating characteristic (ROC) curves were used to describe the prognostic values of resitin, the AUCs for resistin on admission calculated from the ROC curves were 0.862 and the best prognostic cutoff point for resistin on admission was 31 ng/ml: at this level, sensitivity and specificity were 90.32 percent and 83.59percent, respectively.

In conclusions; resistin is a useful marker for detecting prognosis in patients with severe traumatic brain injury. GCS, GOS and CT-brain were good parameters for detecting prognosis in patients with severe traumatic brain injury.

CONCLUSIONS

- Road traffic accident is the leading cause of severe traumatic brain injury.
- Traumatic brain injury is more common in young adult males.
- Resistin is a useful predictor of the functional outcomes in patients with severe traumatic brain injury.
- GCS and CT-brain are good parameters for detecting prognosis in patients with severe traumatic brain injury.