

“Prevention is cure, Education is essential” – responsible implications of young people in educational and prophylactic actions against accidental cervical spinal cord injury and severe disabilities by diving in unverified waters

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Abstract

Introduction: Encouraged by the favorable outcomes of previous mediatic national prophylactic campaigns, initiated and sustained by the medical team of Teaching Emergency Hospital “Bagdasar-Arseni” and National TV Channels (ProTv, TVR1) focused on the risk of severe disability after cervical spinal cord injury (CSCI) by diving in unknown waters, we decided to continue increasing awareness education actions. The previous prophylactic campaigns were followed by a statistically significant reduction in the number of young patients admitted to hospital with quadriplegia after diving in unverified waters (26.8% in 2016 and 39% in 2017). Starting from the ISCoS paradigm “**Prevention is cure**”, we have resumed the prophylactic educational actions addressed to healthcare professionals (students, residents, young doctors) in campaigns to prevent CSCI and accidental tetraplegia during summer sports. The objective of the study was to test medical, diving biomechanical level of knowledge and circumstances regarding risks associated with diving in unknown waters, among young kinetotherapy FMAM students (under the age of 35). The study has the Teaching Emergency Hospital “Bagdasar-Arseni” Ethics Committee's approval NO 17464/14.06.2019.

Materials and methods: The research was conducted using the questionnaire technique, containing 16 closed questions addressed to a number of 40 students from Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

Results: We observed that most of the young students act precociously: 67.5% swim in special designated places, 77.5% dive with their feet first, versus 22.5% plunge the head first. Students have a low level of knowledge about biomechanics of plunging and the impressive speeds reached during diving. More than two-thirds of them did not answer the question about the speed reached during diving from 1 m (7.5 m/s, equivalent to 27 km/h) (67.5% students), from 10 m platform (17.5 m/s, 63 km/h) (70% students) and diving from 30 m (25 m/s, 90 km/h) (67% students). Regarding the alcohol consumption before diving, 80% of them responded with “no”, and only 5% responded with “occasional consumption”. Eighteen students (45%) know the main risk of diving in unknown and shallow waters, and 20 students (50%) have responded incorrectly.

Conclusions: Young students - future therapists have a low level of knowledge about CSCI risk and the severe disabilities that can occur accidentally by diving. It is mandatory to continue the education prophylactic initiative sustained activity through mass media, started in 2016-2018.

Key words: *traumatic spinal cord injury, tetraplegia, diving, plunging, unverified / unfamiliar water, summer sports,*

Introduction

Water sports are one of the most popular activities during summertime. However, it can be dangerous due to the fact that many lives are lost each year by drowning. Apart from death, a large number of young people become permanently disabled as a result of diving accidents. (1) High diving injuries are mostly located in the cervical spine, generally at the fifth and the sixth vertebra. Diving accident incidence has been reported to range between 1.2 and 21% (2-6) of all SCI. The average age is 21 years, most patients are males, and associated injuries are rare. (3, 7)

Albrand and Walter (8) provided some useful advice: don't dive in water less than twice your height, don't drink and dive, don't dive into unfamiliar water, don't permit or indulge in horseplay while swimming or diving. (8) Another helpful recommendation is to “lock” hands, with the arms extended in the diving position, in order to protect the head and neck when diving into shallow water. (3)

Blivitch et al (9) recommend that “divers strive to surface in as short a distance as possible by

maximizing flight distance and aiming for a low entry angle”.(8, 9)

Therefore education and diving technique appear to be outstanding considerations in injury prevention.

Diving injuries of the cervical spine demonstrate high mortality and morbidity rates. Recovery depends on the severity of the initial neurological damage. (10)

Objective:

The objective of the study was to test medical and biomechanical level of knowledge on diving and the circumstances regarding risks associated with diving in unknown waters, among young kinetotherapy students (under the age of 35).

Materials and methods:

The research was conducted using the questionnaire technique, containing 16 closed-ended questions addressed to a number of 40 students (aged 19-23) from “Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

A questionnaire represents a research instrument consisting of closed-ended questions which aims to gather specific information from the chosen respondents. Questionnaires focus on the sampling of a smaller population statistically representative of the wider population in question. The technique was invented by the Statistical Society of London in 1838. (11-13)

A distinction is made between open-ended and closed-ended questions. An open-ended question asks the respondent to formulate his own answer, whereas a closed-ended question has the respondent pick an answer from a given number of options. The response options for a closed-ended question should be exhaustive and mutually exclusive. (14)

Questionnaires have advantages over some other types of surveys in that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys, and often have standardized answers that make it simple to compile data.

Results:

1. Do you take a bath in waters that are not specially designed for swimming?

a.Never, b. Rarely, c. Often, d. Always

We observed that most of the young students act precociously, 67,5% of them swim in special designated places (fig 1)

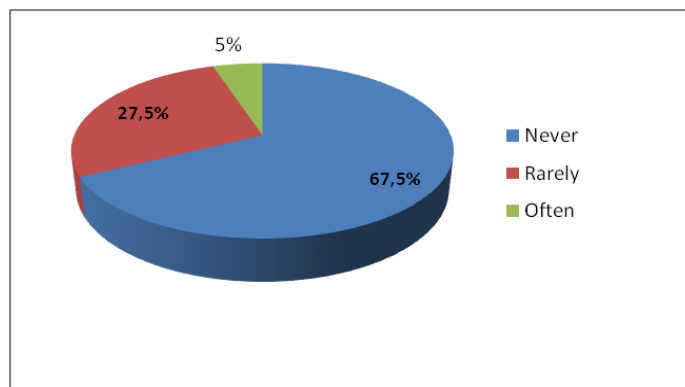


Fig 1

4. Do you check how deep the water is before jumping?

a.Never, b. Rarely, c. Often, d. Always

In the chart below, we observe that 92,5% always or often check the depth of the water, whereas 7,5% of them rarely check the depth of the water before jumping (fig 2)

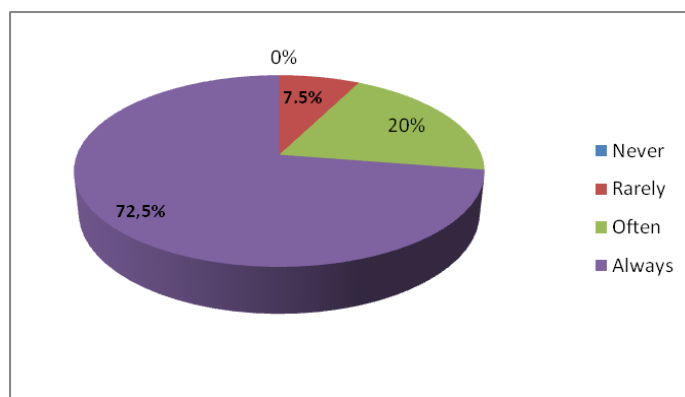


Fig 2

2. How do you plunge into the water?

a. Head first, b. On your back, c. On your belly, d. Feet forward, e. Feet crouching (fig 3)

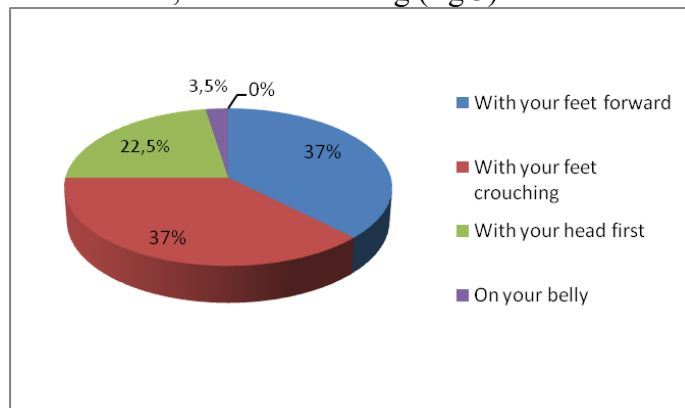


Fig 3

The chart above represents the sum of the second and third questions.

3. How often do you jump head first into the water ?

- a. Never, b. Rarely, c. Often, d. Always

Most of them, 77,5% jump feet first and 22,5% head first. (fig 3)

5. What are the risks of diving in shallow water?

- a. Cervical spine fracture, b. Head injury and loss of consciousness, c. Fractures of the limbs, d. Epistaxis (bleeding on the nose), e. There is no risk

Eighteen students (45%) know the main risk of diving in unknown and shallow waters, which is represented by cervical spine fracture (SCCI).

Meanwhile, 20 students (50%) have responded incorrectly (fig 4).

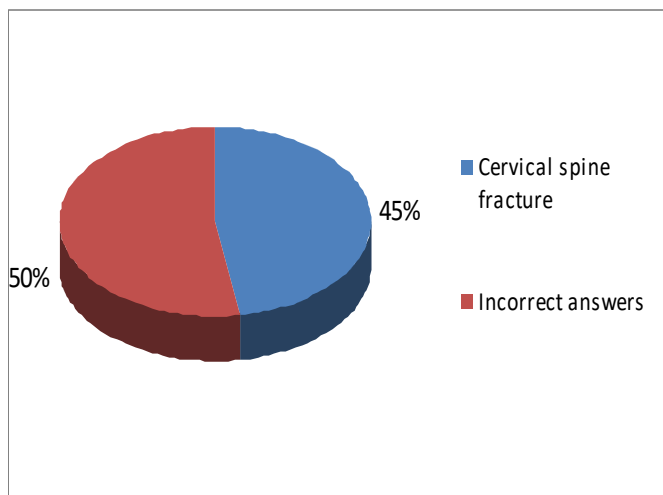


Fig 4

6. Do you consume alcohol before diving?

- a. Never, b. Rarely, c. Often, d. Always

About 80% responded with "no", 15% "occasional consumption", and 5 % "often". Therefore, most of the students do not consume alcohol before diving (fig 5).

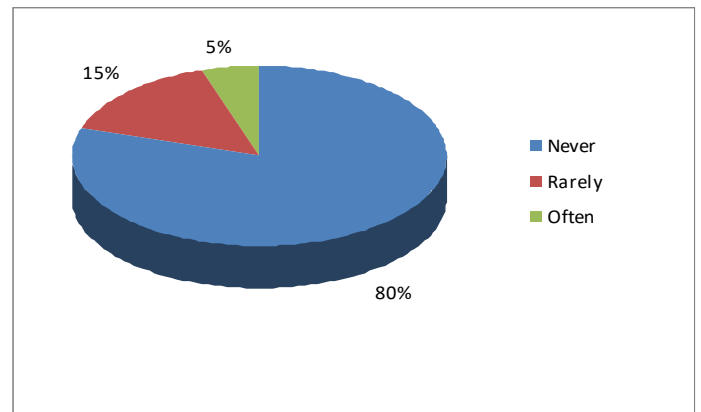


Fig 5

Referring the biomechanics of plunging

9. How deep should the pool be so you can safely dive from the starter block ?

- a. 1 m, b. 1,5 m, c. 2 m, d. 3 m, e. I don't know

A small part of the respondents (32,5%) knew the correct answer, which is 3 meters. Most of the respondents, though, did not know the correct answer (67,5%) (fig 6)

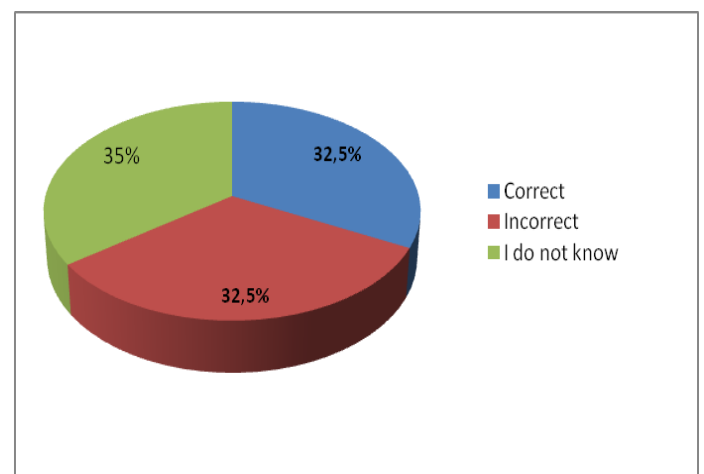


Fig 6

12. At what speed does a person weighing 60 kg reach the water if he plunges obliquely from 1 meter?

- a. 1m/s, b. 3m/s, c. 5m/s, d. 7,5 m/s, e. I do not know.

15. At what speed does the person who dives from the 10 meter platform reach the water?

- a. 1 m/s, b. 3 m/s, c. 5 m/s, d. 17,5 m/s, e. I do not know

16. In the case of diving in water from 30 meters it is estimated that the water is reached with a speed of:

- a. 10 m/s, b. 15 m/s, c. 20 m/s, d. 25 m/s, e. I do not know

In the charts below, we noticed that students have a low level of knowledge about biomechanics of plunging and the impressive speeds reached during diving. More than two-thirds of them did not answer the question about the speed reached during plunging.

Therefore, from 1 m (7.5 m/s, equivalent to 27 km/h) 67.5% of the students did not know the correct answer, from 10 m platform (17.5 m/s, 63 km/h) 70% students of the students, and from 30 m (25 m/s, 90 km/h) 67% of them responded incorrectly (fig 7,8,9).

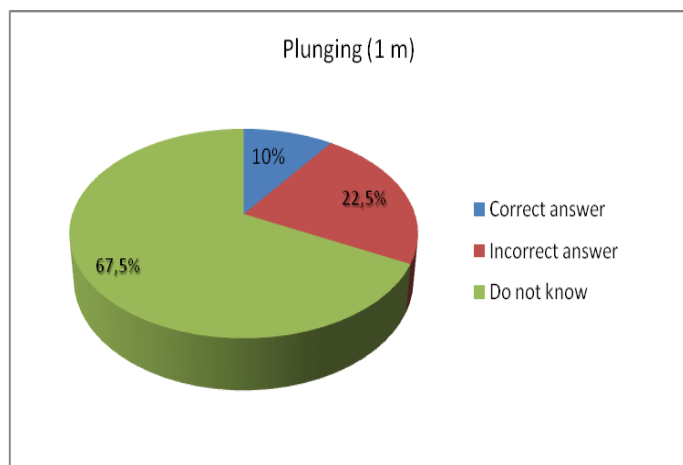


Fig 7

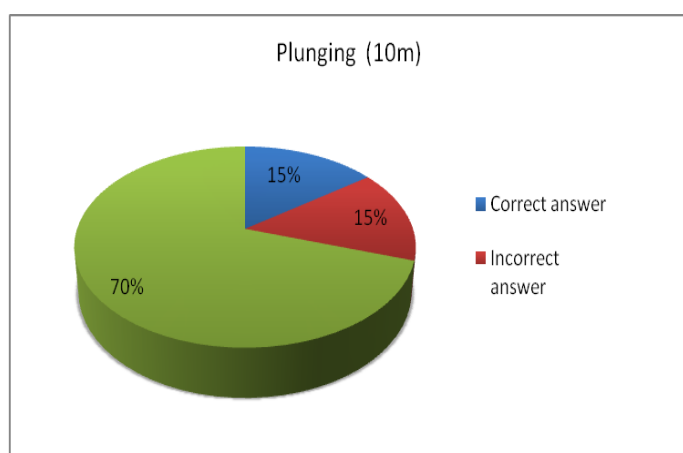


Fig 8

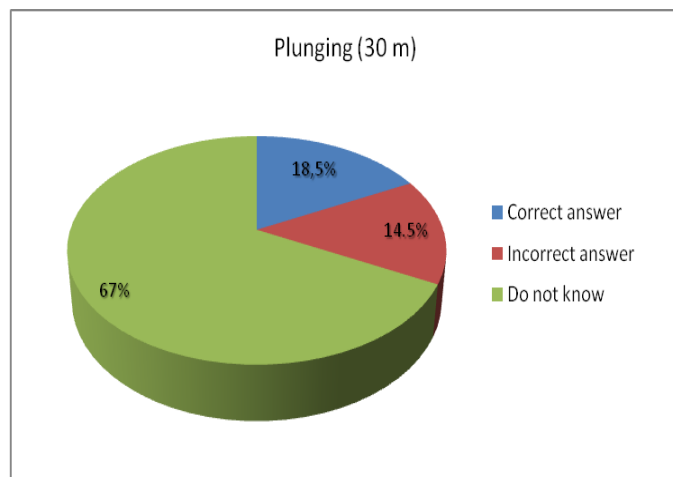


Fig 9

14. How deep should the pool be, in order to dive from above (trampoline, platform, rock)?

- a. 2 m, b. 3 m, c. 5 m, d. 8 m, e. I do not know

The pool should have 8 meters, and a small percentage of the students (25%) knew the correct answer, but most of them (75%) did not know or responded incorrectly. (fig 10)

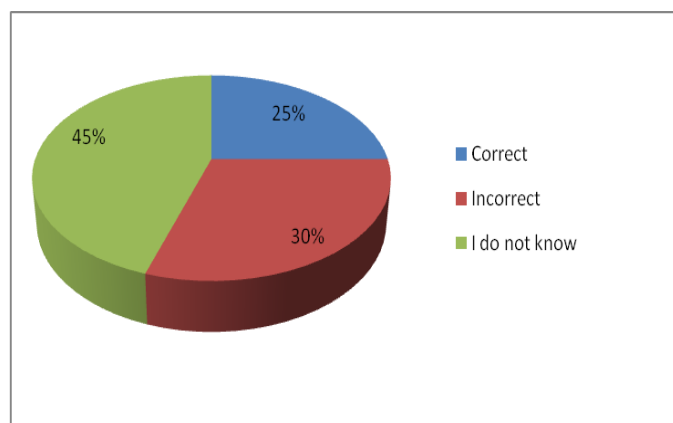


Fig 10

Discussion

Encouraged by the favorable outcomes of previous national prophylactic campaigns, initiated and sustained by the medical team of Teaching Emergency Hospital "Bagdasar-Arseni" and National TV Channels (ProTv, TVR1) focused on the risk of severe disability after cervical spinal cord injury (CSCI) by diving in unknown waters, we decided to continue increasing awareness on education endeavors. (15) The previous prophylactic campaigns were followed by a statistically significant reduction in the number of young patients admitted to hospital with quadriplegia after diving in unverified waters, 26.8% in 2016, 39% in 2017.

Starting from the ISCoS paradigm "**Prevention is cure**" (16), we have resumed the prophylactic educational actions addressed to healthcare professionals (students, residents, young doctors) in campaigns to prevent CSCI and accidental tetraplegia during summer sports.

CONCLUSIONS

This study revealed that young population, future therapists, have a low level of medical and biomechanical knowledge about plunging head first, the risk for CSCI and the severe disabilities that can occur accidentally by diving. The majority of them responded well in terms of knowledge about the alcohol consumption before diving, never swim in waters that are not specially designed for swimming in, and checking the depth of the water before plunging.

Although our campaign had promising results, we make a permanent objective of our clinic's division to **continue** the sustained education and prophylactic initiatives through mass media.

Author contributions

Angheliescu Aurelian has designed the study, collected data, and contributed to writing the manuscript

Constantin Elena and Mihaescu Anca Sanda processed data and contributed to writing the manuscript

Gelu Onose reviewed and approved the manuscript

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