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Effect of Cosmic Radiation on Flying Personnel in the Republic of Congo

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ABSTRACT

The objective of our study was to show the effect of cosmic radiation on flight personnel. The study, which was conducted at the international airport in Maya-Maya, Republic of the Congo, was the first of its kind in Africa. The information was gathered included information on 55 pilots, 5 hostesses, and 70 civilian or military administrative staff members who were in charge of aviation. The crew members' ages ranged from 35 to 45 years old, with the highest two extremes being 25 and 60 years old. Of them, 91, 60% were men and 8, 40% were women. The average length of an aller-retour flight was 267.7 hours, and the average flight height was 17816.62 feet. The infections and illnesses that were encountered affected 76% of secondary sterilization cases, 68% of visual acuity decline cases, 64% of auditory acuity decline cases, and 52% of phlébite cases. As a result, when doing their professional duties, navigation staff members are exposed to the effects of cosmic radiation, which is harmful to their health. This relates to leucémies that may be exacerbated by abnormal exposure to cosmic radiation.

Keywords: Effect – Cosmological Radiations- Employee navigator

INTRODUCTION

The discovery of cosmic radiation dates back to the beginning of the 20th century. The history of this science is deserved to be counted because it is contained many lessons of melody and a number of heroic deeds. One of these stories, which we will be focus on here, is about the discovery of extremely high energy cosmic radiation between the years of 1912 and 1964. Certain physicians, and in particular Victor Franz Hess had been understood the principle of the growth of primary high-energy particle gerbes that, during

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their course, they interact to lead to the growth of the particle gerbe until the characteristic energy is become too low to initiate the formation of a new particle or until the processes of absorption inside the target and disintegration become significant. Also known as cosmic rays or ionizing cosmic radiation, particles are the nucleus of elements like iron or nickel, moving at a speed that is close to that of light. They can be travelled millions of light years through space before randomly hitting Earth. These rays were not done pose much risk to humans on the earth's surface, although the planet's atmosphere and magnetic fields protect us from most of these threats. However, there is still some risk for air traffic controllers. These cosmic rays are travelled through interstellar space at speeds that are comparable to light's speed. The term "radiation" is used to describe them, although in reality, it is refered to elementary particles or charged particles, the majority of which are ionized hydrogen particles. Energy storage in matter causes a number of changes at the molecular level of the target on both a physical and chemical level. These events happen in a sequential manner over time. The most recent reports on the cosmic level in the stratosphere show that they increased by 12.5% between 2015 and 2016. This was released by the Space Veather team on September 11, 2016, with these astronomers citing the decrease in solar activity as the cause. According to certain studies, cosmic radiation can be lead to direct increases in heart attack and death rates among cardiac patients, as well as disruptions in electrical circuits were used in medical settings. A portable computer or cell phone malfunction is not as serious as it would be for a cardiac defibrillator. The physician Ailleen M. Ferick of the New York Medical Center presented the findings of three patients' studies in 2008, concluding that an increase in cosmic radiation during a plane trip had interrupted the functioning of implanted automatic defibrillators, therefore, he recommends greater recognition of the issue. Seldom has the impact of cosmic radiation been examined in Africa. This demonstrates the relevance of our research's theme [1].

MATERIALS AND METHODS

Plan Material:

Several biomedical materials have been used in this study. The ophthalmological consultation table, the electrocardiogram (ECG), the audiogram (ORL), and the visual field (ophtalmological). It was taken place in February 2019 to arrange the dates of interviews with relevant subject matter experts and were enabled the determination of the target population and its sample, research instruments, and the questionnaire. We are approaching them with the survey form from our studies to get their opinions on the research topic. Completing the questionnaire data were assessments of visual acuity, audiography, ECG, counting, blood formula, pulmonary radiography, and a variable-related urinary test that took into account sociodemographic traits, age, gender, occupation, and length of service. Some factors were related to workplace safety include evaluating working conditions, understanding risks associated with the pilot's profession, being aware of cosmic radiation, having a structure and protective measures in place, and making necessary corrections to prevent cosmic radiation. Some characteristics related to pilot activities include the number of flights per year, average flight duration, number of flight hours per year, and flight altitude. Some factors related to the visit include size, weight, IMC, arterial tension, urine examination, ECG, external ear examination, and audiogram. Following the properly collected data, study-related information was verified by journal-style journaling. The next step will be to fix any potential errors made when filling out these questions.

Methods:

This is a descriptive-analytical study that took place from February to July 2019, with the study population consisting of the following two targets: the military and civilian pilots, were followed by air hostesses and various level supervisors in the civil or military aviation industry. Over the course of the collection, an exhaustive review of all the subjects were submitted for the study was conducted. In addition to applicable data collection tools and procedures, interviewing, questioning, and physical and virtual document research

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have made it possible to tighten the process and even demolish some unfriendly environments, if there have been any resistant subjects willing to participate in the questionnaire completion exercise. This research was included reading relevant theses, memoirs, and are booked on the topic under investigation in addition to visiting websites related to the topic of our investigation. We carried out the medical examination of the civil and military pilots.

The interview was included resource persons such as blue and was red beret military personnel, members of the air force's high hierarchy, mechanics, and other logisticians, in addition to political and administrative authorities in charge of military and civilian aviation matters. Insofar as it has facilitated a variety of interactions to varying degrees, the observation of the study field has shown to be a reliable method of ascertaining, if not the actuality, of the researcher's intellectual approach.

RESULT

Following data collection, fifty-five (55) pilots, five hosts, and sixty-six (70) military administrative or civil staff members in charge of civilian or military aviation were listed.

Features of the Sociodemographic

The sociodemographic diversity of military and civilian personnel is here a subject of interest to better understand the impact of cosmic radiation on their health.

Military or civilian personnel

Study constraints

The main challenges were encountered in conducting this study result in the following: The difficulty some interviewees have been answered the questionnaires, incomplete questionnaires, an inadequate amount of available materials, and the research budget issue.

Table 1: Distribution of military administrative or civil staff according to sociodemographic characteristics

Age (years)	Number (N)	Percentage (%)
25-30	2	3
30-35	6	9
35-40	16	23
40-45	12	17
45-50	07	10
50-55	05	07
55-60	07	10
Sexe		
Male	54	80
Feminine	16	20
Profession/occupation		
Lead Station	1	1
Chief of Staff	1	1
Head of corps	1	1

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Advisors	3	4
Company order	2	3
Section Head	19	27
Head of Service	13	19
Collaborators	30	43
Total	70	100

During data collection, 55 pilots, 5 hostesses and 70 civil or military administrative personnel in charge of aviation were identified.

Employee navigator

Table 2: Distribution of the Navigating Personnel according to their sociodemographic characteristics

Age (years)	**Number (N)**	**Percentage (%)**
20-25	02	03
25-30	01	02
30-35	03	05
35-40	06	10
40-45	27	45
45-50	15	25
50-55	04	07
55-60	02	03
Sex		
Male	55	90
Feminine	05	10
Profession/occupation		
Captain	41	68
Co-pilot	14	23
Announcer	02	03
Other collaborator	03	05
Total	60	100

Characteristics of the working environment for navigation personnel: According to the civilian or military staff in charge of flying: awareness of the existence of cosmic radiation.

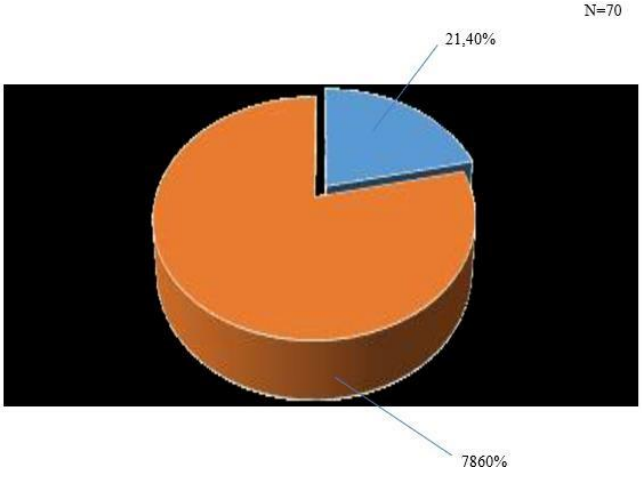

Figure 1: State of knowledge of personnel in charge of aviation on cosmic radiation

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Effects of cosmic rays on the health of cabin crew

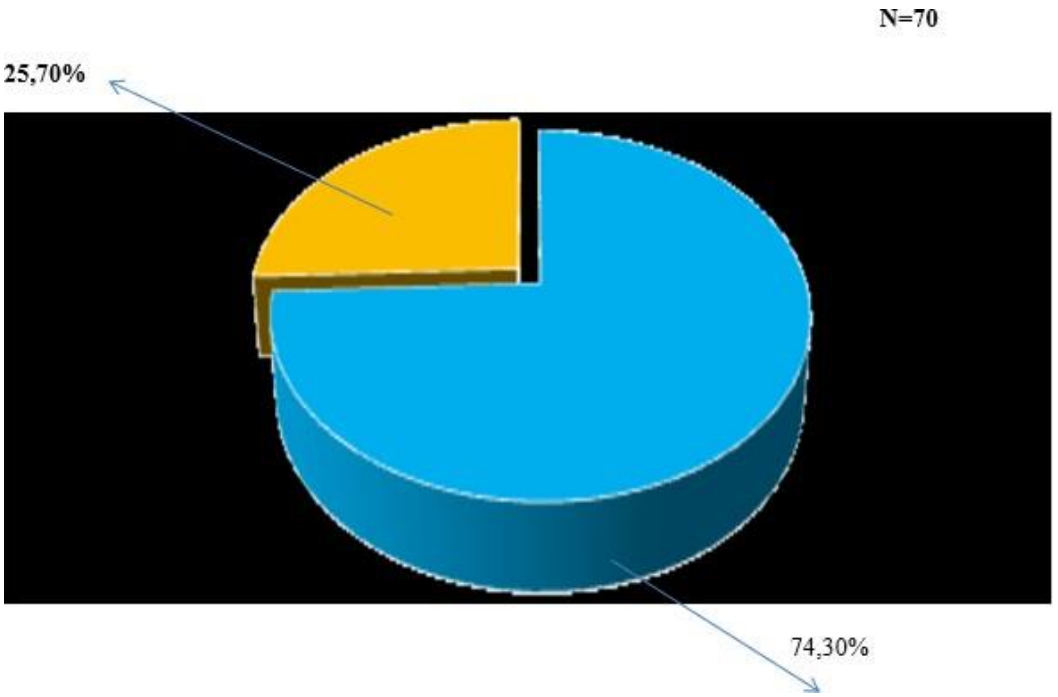

Figure 2: Effect of cosmic radiation according to aviation personnel

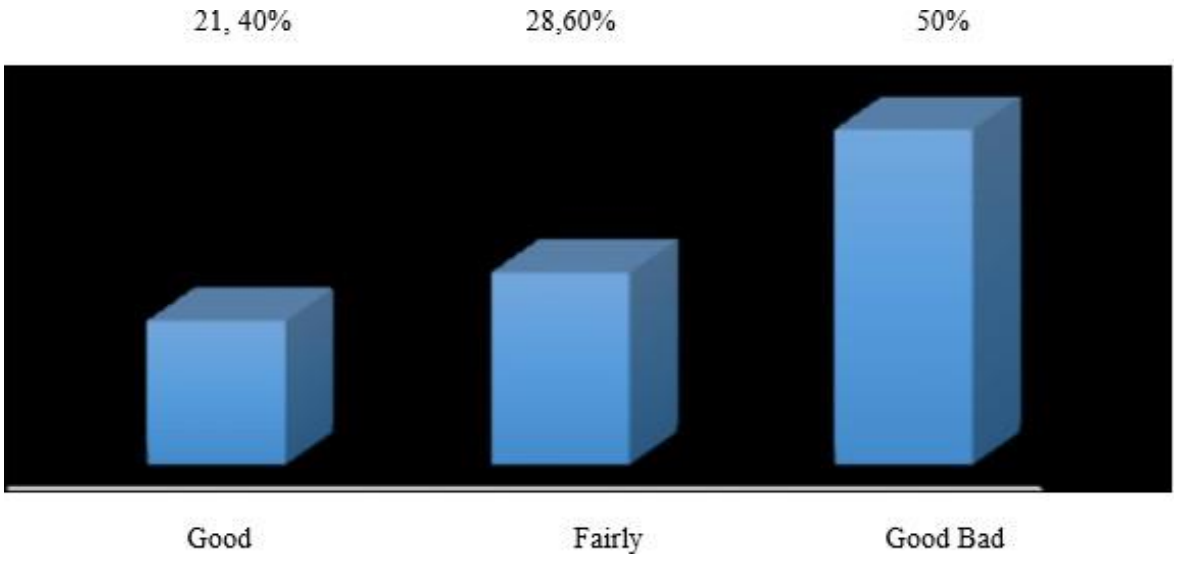

Figure 3: Working conditions of pilots according to aviation personnel

Existence of Protection/Regulation Measures

10 out of 15 managers were unaware of the existence of measurements or regulations relating to cosmic radiation: According to the flight crew.

Knowledge of the effects of cosmic radiation on health

100% of flight crew were aware of the effects of cosmic radiation on their health.

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Working conditions

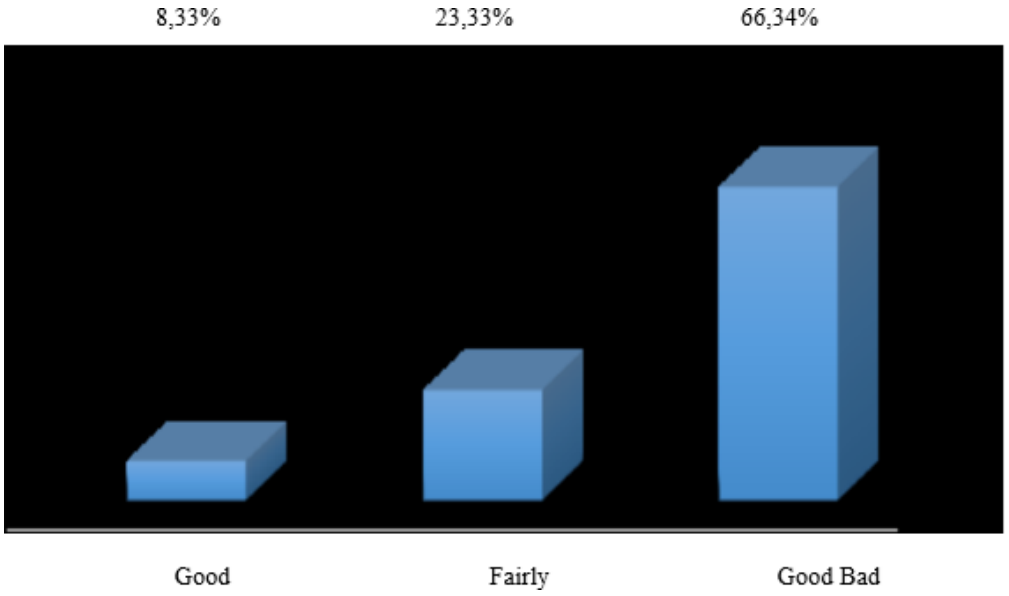

Figure 4: Working conditions according to flight crew

Existence of regulations or protective measures

83.33% of pilots and stewardesses were unaware of the existence of regulations and protective measures in force with regard to cosmic radiation.

Characteristics of pilot activities: Number of flights/year

Table 3: Characteristics of the number of flights per year

Features	**Values**
Average	336,6
Moderate	340
Ecart category	301,84
Minimum	4
Maximum	960
Valid	20

Tableau 4: Features of the average duration of an aller-return flight

Features	**Values**
Average	267,7
Moderate	90
Ecart category	220,20
Minimum	90
Maximum	680
Valid	20

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Tableau 5: Characteristics of the number of flying hours by year

Features	Values
Average	1529,95
Moderate	300
Ecart category	2417,40
Minimum	12
Maximum	10653
Valid	20

Table 6: Characteristics of the total number of hours as of 07/31/2019

Features	Values
Average	15705,85
Ecart category	10637,14
Minimum	82
Maximum	11549,4
Valid	20

Table 7: Flight altitude characteristics

Features	Values
Average	17816,62
Moderate	8000
Ecart category	11950,92
Minimum	3333
Maximum	35000
Valid	20

Combination of Visits

Table 8: Distribution based on Visitor Results

	Number (N=25)	Percentage (%)
Secondary sterility	19	76
Visual acuity	17	68
Hearing acuity	16	64
Phlebitis	13	52
Albumin positive	01	04
Positive sugar	01	, 04

DISCUSSION

Most of the study's people are between the ages of 4 and 8, with the exception of those who are between the ages of 2 and 16. At Paris Descartes, Camille Mégard [5] were discovered an average age of 53,15, with extremes [3-23]. Jean-Marie [19] were reported a significantly lower average age of 22.8 years in this series. Our staff members offer a shorter time of exploitation. Furthermore, since entering service, the average number of flying hours have only been 1570,85 hours. Gender: 91.60% of the population is male.

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Superposable result to that of Camille Mégard at Paris Descartes [6], who was discovered a 98.60% male predominance. The average duration of a round trip is 267,7 hours. Jean-Marie was spent 173 hours back in her study. The average duration of a round trip is 267,7 hours. Jean-Marie spent 173 hours back in her study. This low rate is suggested that a shorter exposure time might be reduced the chance of a cosmic radiation effect. The risk of chromosomal translocation is higher among pilots in the highest quartile of number of flight years, indicating a biologically significant effect of ionizing radiation on long-haul pilots [5]. The average was flight altitude is 17816,62 feet. According to Victor Franz Hess's study, cosmic radiation is around 100–300 times more intense between 10,000 and 120,000 meters above Earth [8]. After an 18-kilometer flight, every component of the human body is within reach, and some cells may be undergone functional modifications [20]. The outcomes of the visits: In the A-S study, we were discovered 18 cases of sterility, or 76%; it was also discovered that air hostesses were tended to have fewer pregnancies and later pregnancies.

According to the aviation medical manual [16], 15% of pilot personnel's embryos miscarry during the first trimester. These false couches may be also result in problems such as post-amputation hemorrhage, pelvic inflammation, peritonitis, or sepsis. Andujar and Coll. [17] were reported that ionizing radiation can be caused birth defects, aversions, and a delay in the development of the brain as well as agrowth retardation during pregnancy. The crew members were reported that their last pregnancy had been resulted in a spontaneous fetal loss almost twice as frequently as the other almost twice as many agents on board were reported that their last pregnancy had been resulted in a spontaneous fetal loss. A decrease in visual acuity was found in 17 navigators, or 68%. Jacques Barex [10] and colleagues were reported the frequency of ocular dryness among navigation staff. Less than an hour's worth of voletement due to evaporation, which is aided by pollutants, is the cause [15]. Beckman's eye experiments are demonstrated the possibility of retinal diseases were caused by heavy ion exposure. It is feasible for personnel who navigate to have such effects [19]. The auditory acuity was abnormal in 16 people, or 64%. B.A. Grauzere et al. were reported hemorragies under the epithelium of the external ear [11]. The otite barotraumatique is frequently seen by navigation staff. This state is characterized by feelings of extreme pain, acouphènes, and occasionally vertigo. Depending on the test, orthopaedic consults can be categorized into five or six levels [16]. Thirteen employees, or 52%, have thrombotic or phlebite disease. B.A. [12] were discovered an additional risk factor for deep vein thrombosis, particularly when the duration of the stroke exceeds six hours. Were on research based by Jacques [13] [14], this risk is multiplied by 1.5 to 3 times while flying at high altitude. These studies are described the likely relationship between the occurrence of deep vein thromboses and long-haul are flighted. In 1988, Cruikshank was described the economic class syndrome. Flight length greater than three to four hours, history of venous insufficiency and varicose veins, women over 40 years old and men over 50 years old would be factors favored this risk A study was conducted over a four-year period with nine thousand business travelers were revealed that a phlébite is occured every 4656 flights and that the risk is increased with the number of consecutive flights. Therefore, you must be stayed for at least two weeks to lower the risk. [18] in a review of the literature, have been demonstrated that long-distance travel increases the risk of thromboembolism two to four times and that the risk is increased after four hours of travel.

CONCLUSION

The primary goal of the study was to demonstrate how cosmic radiation affects Congolese maritime personnel, and this goal was accomplished. Data is gathered through the use of an inquiry and interview questionnaire, as well as through documentary research and medical visits. The obtained is results demonstrated that among the navigation staff, there are clinically significant risks to their health due to the presence of diseases such as secondary visual acuity, lower auditory acuity, and phlebite. As a result, there is a pressing need to establish a national dosimetry center whose purpose would be to measure the dose of cosmic and ionizing radiation contracted over the course of staff members' professional activities in the Democratic Republic of the Congo. The recommendations should be made in order to inform the

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government, high ranking officials of the Congolese air force, and CEOs of businesses about the necessity of the following actions. Developing or updating a specific regulation to safeguard the health of pilots and other navigation staff. Even though flying is an extremely dangerous profession, the Congo must be adhered to the current international regulations because of this. While performing their professional duties as medical and navigation staff. They conclude that if the ionizing radiations used in radiotherapy have this effect, then a similar stress may be responsible for the emergence of leucémia in navigators. It is well known that frequent flights at high altitudes expose pilots to cosmic radiation. They fall under the category of ionizing radiations.

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