ROAD TRAFFIC ACCIDENTS AND HEALTH COMPLICATIONS DURING THE KEDARNATH YATRA:

A RETROSPECTIVE STUDY

Submitted by-

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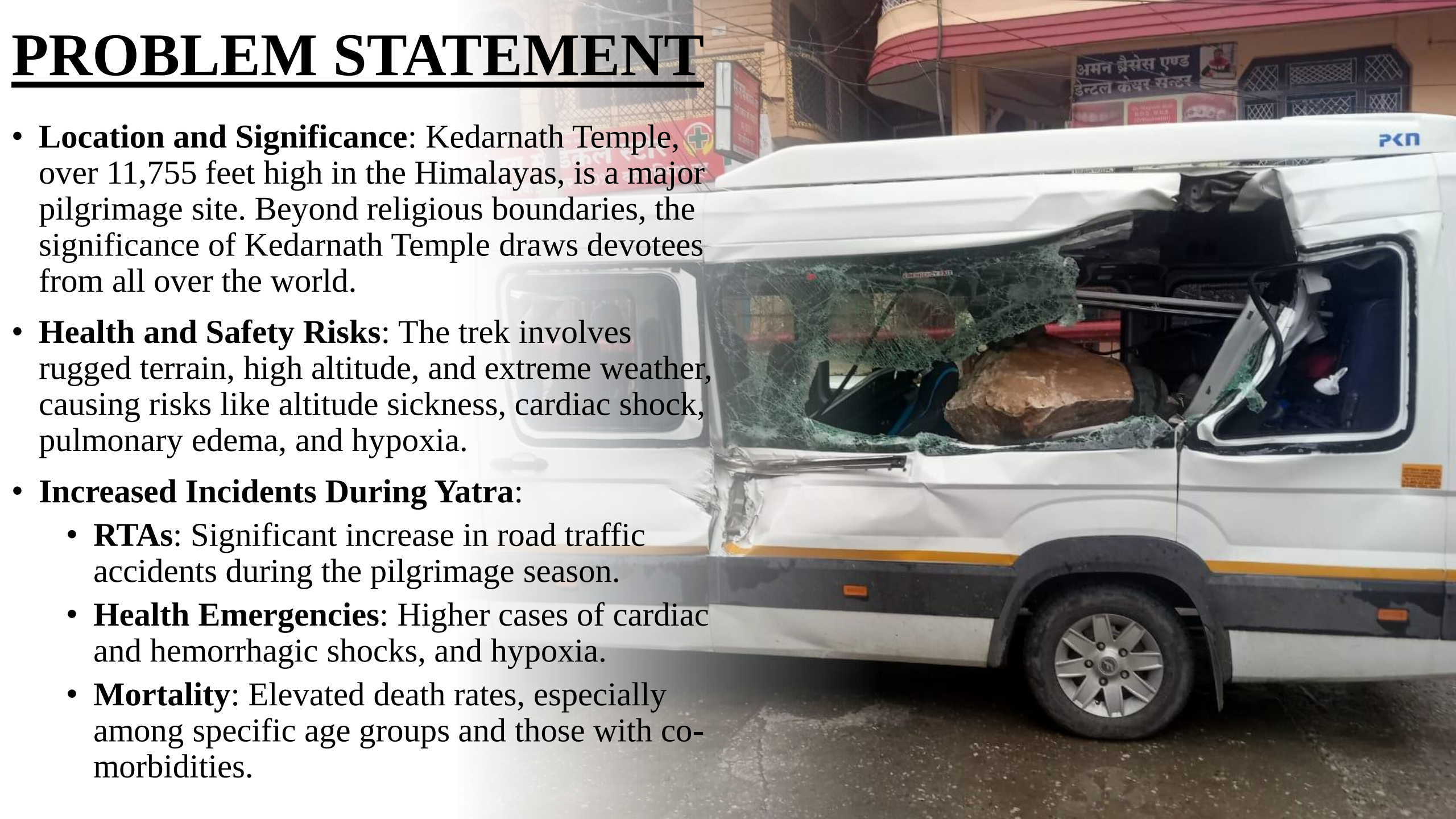
PROBLEM STATEMENT

- **Location and Significance**: Kedarnath Temple, over 11,755 feet high in the Himalayas, is a major pilgrimage site. Beyond religious boundaries, the significance of Kedarnath Temple draws devotees from all over the world.
- **Health and Safety Risks**: The trek involves rugged terrain, high altitude, and extreme weather, causing risks like altitude sickness, cardiac shock, pulmonary edema, and hypoxia.
- **Increased Incidents During Yatra**:
  - **RTAs**: Significant increase in road traffic accidents during the pilgrimage season.
  - **Health Emergencies**: Higher cases of cardiac and hemorrhagic shocks, and hypoxia.
  - **Mortality**: Elevated death rates, especially among specific age groups and those with co-morbidities.

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AIM AND OBJECTIVES

AIM OF THE STUDY

To assess the specific types and incidence of health complications and road traffic accidents during the Kedarnath Yatra, compare them with non-pilgrimage months, identify vulnerable groups, and propose targeted recommendations to enhance pilgrim safety and health outcomes.

OBJECTIVES OF THE STUDY

1. To determine the incidence and types of health complications (e.g., cardiac shock, hemorrhagic shock, pulmonary edema, hypoxia) during the Kedarnath Yatra.
2. To investigate the occurrence and demographic distribution of road traffic accidents among pilgrims.
3. To identify age groups, genders, and individuals with pre-existing conditions who are most vulnerable to health complications and accidents.
4. Compare the incidence of health issues and accidents between pilgrimage and non-pilgrimage seasons.
5. Provide recommendations for improving medical facilities, emergency response systems, and preventive measures to enhance pilgrim safety.

RESEARCH QUESTIONS

1. What is the incidence and nature of health complications during the Kedarnath Yatra?

2. What is the occurrence and demographic distribution of road traffic accidents during the Kedarnath Yatra?

3. Which age groups, genders, and individuals with pre-existing conditions are most vulnerable to health complications and accidents during the Kedarnath Yatra?

4. How does the incidence of health issues and accidents during the Kedarnath Yatra compare to the non-pilgrimage season?

5. What recommendations can be made to improve medical facilities, emergency response systems, and preventive measures to enhance pilgrim safety during the Kedarnath Yatra?

RESEARCH METHODOLOGY

PLACE OF STUDY: Study Was Conducted At District Hospital, Rudraprayag, Uttarakhand.

STUDY DESIGN: Observational Retrospective Cohort Study.

DURATION OF STUDY: March 18, 2024 To June 17, 2024.

SAMPLE SIZE: All Cases Were Observed During The Period Of Study.

DATA COLLECTION: Relevant details regarding health-related conditions, complaints, mortality, and road traffic casualties were collected from hospital records, including both physical and electronic health records (EHR). Data encompassed specific health issues such as altitude sickness, cardiac and hemorrhagic shock, pulmonary edema, and hypoxia. Mortality data and road traffic accident (RTA) incidents were documented, along with demographic information on age, sex, and pre-existing health conditions. Information was gathered for both the pilgrimage season (May 2023-November 2023) and non-pilgrimage period (April 2023, December 2023-March 2024), covering outpatient and emergency department visits.

OBSERVATIONS AND RESULTS

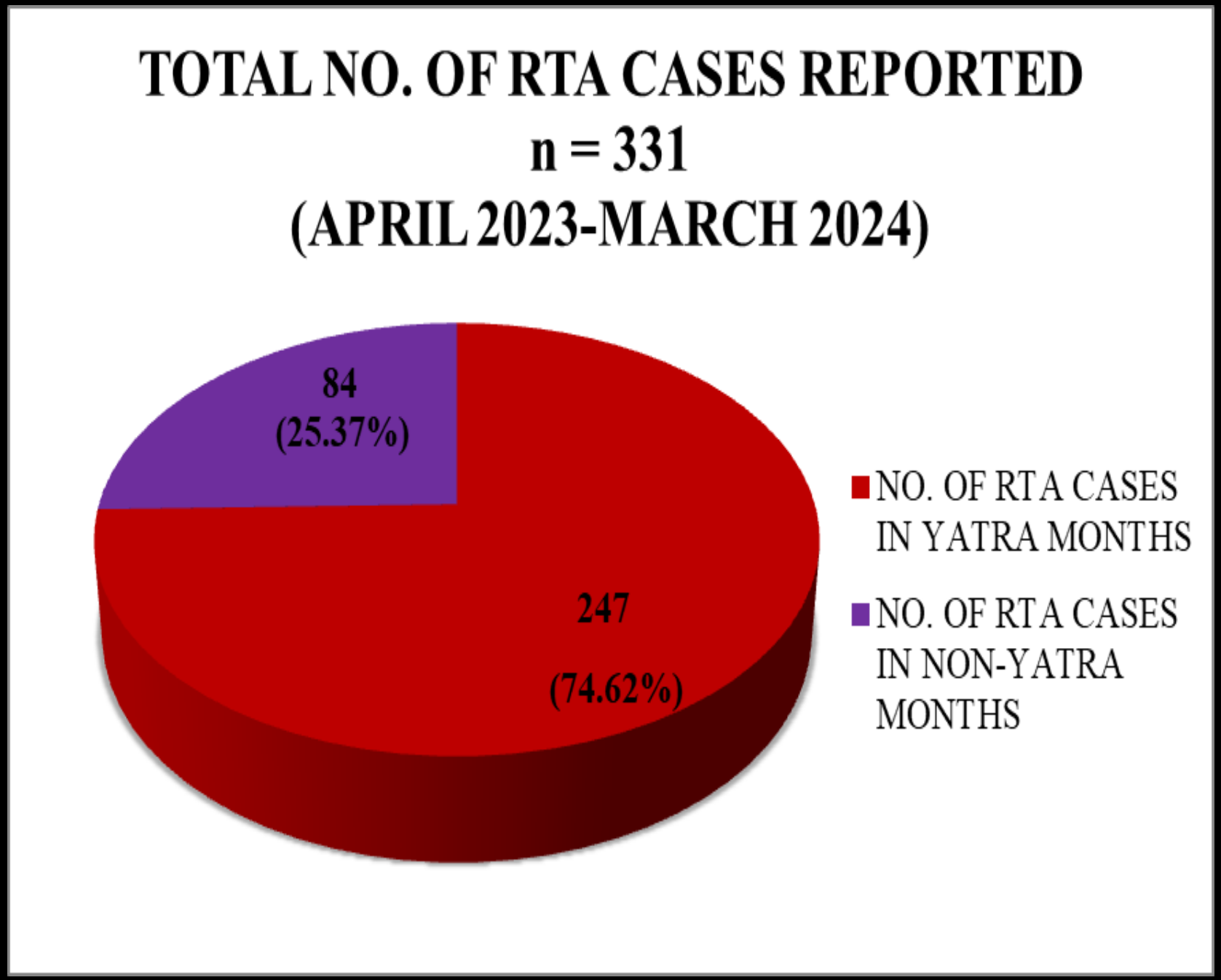


Figure 1: PIE CHART REPRESENTING THE NO. OF RTA CASES REPORTED DURING YATRA AND NON-YATRA MONTHS

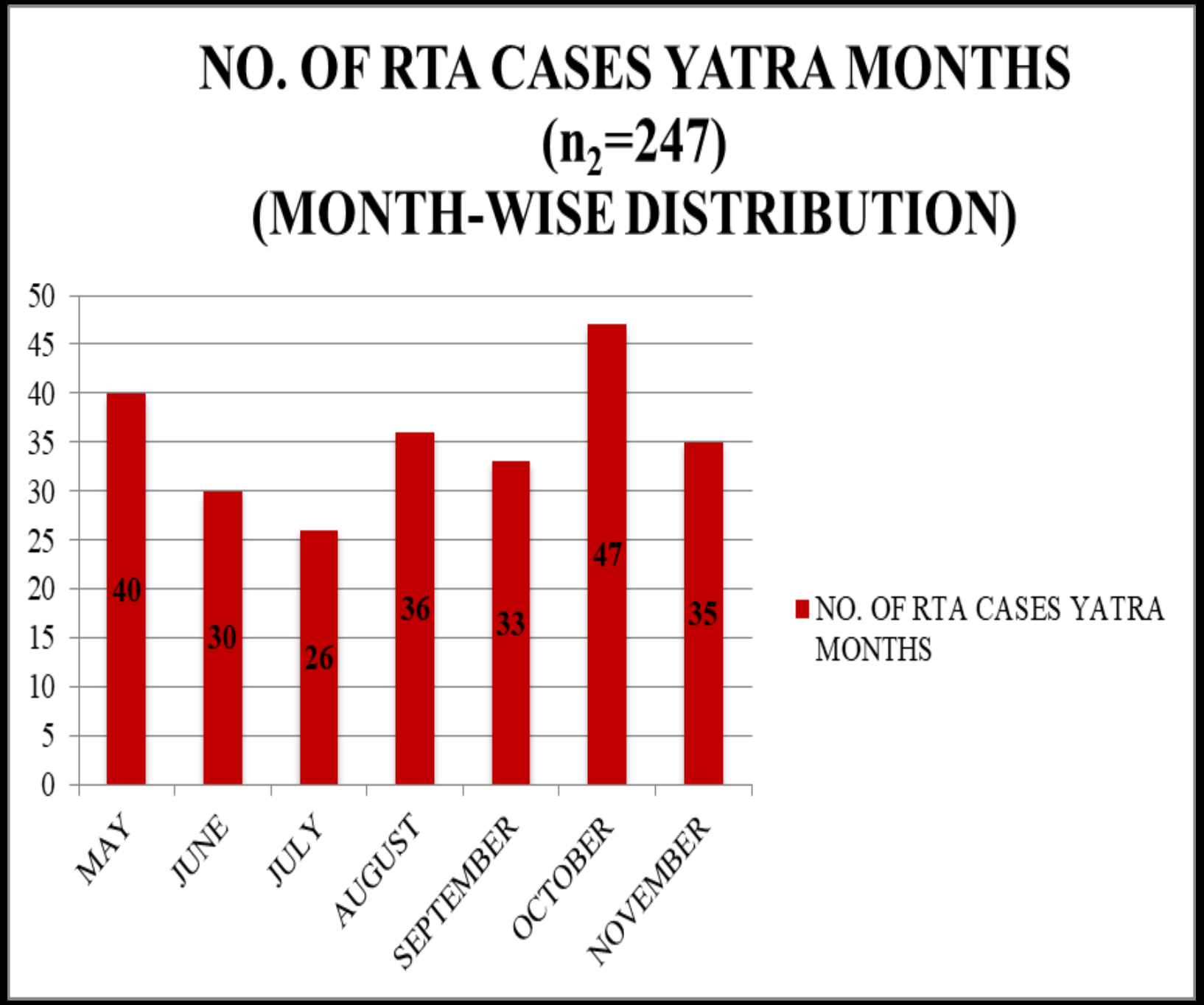


Figure 2: BAR GRAPH REPRESENTING MONTH-WISE DISTRIBUTION OF THE NO. OF RTA CASES REPORTED IN YATRA MONTHS (n_2=247)

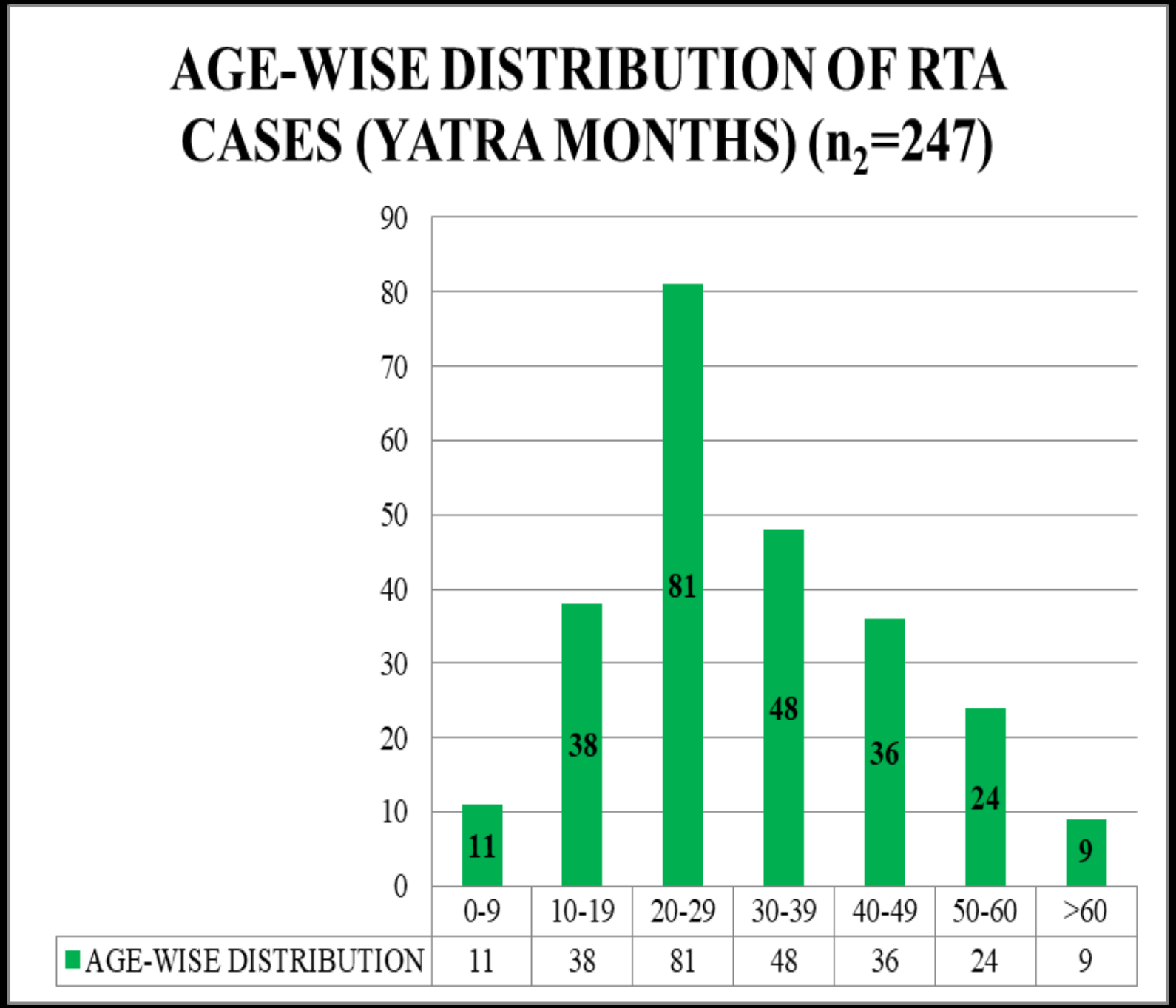


Figure 3: BAR GRAPH REPRESENTING DISTRIBUTION OF THE CASES OF RTA REPORTED IN YATRA MONTHS ACCORDING TO THE AGE GROUP (IN YEARS) (n_2=247)

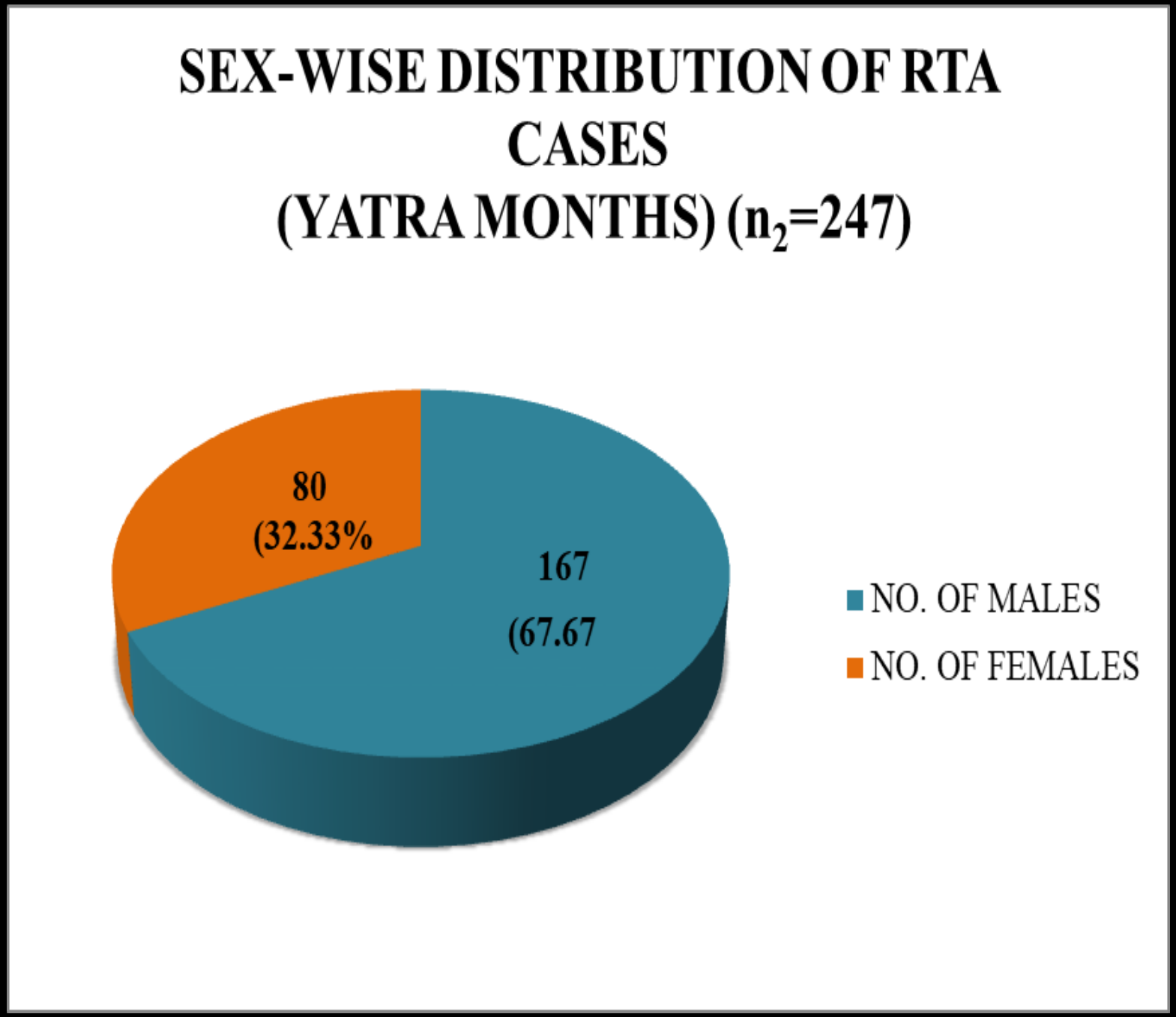


Figure 4: PIE CHART REPRESENTING DISTRIBUTION OF THE CASES OF RTA REPORTED IN YATRA MONTHS ACCORDING TO SEX (n2=247)

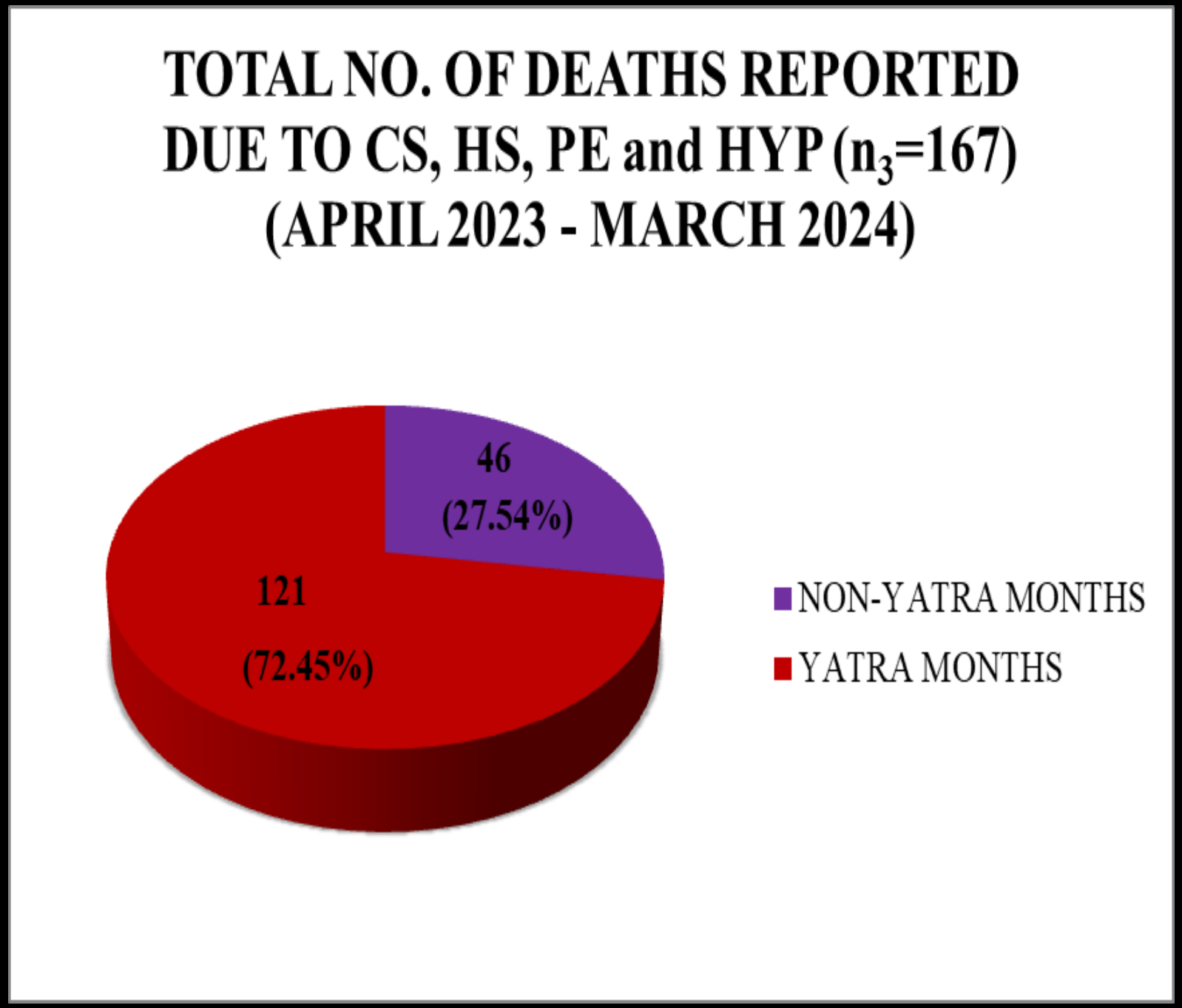


Figure 5: PIE CHART REPRESENTING THE TOTAL NO. OF DEATHS REPORTED DUE TO CS, HS, PE and HYP DURING NON-YATRA AND YATRA MONTHS (n_3=167)

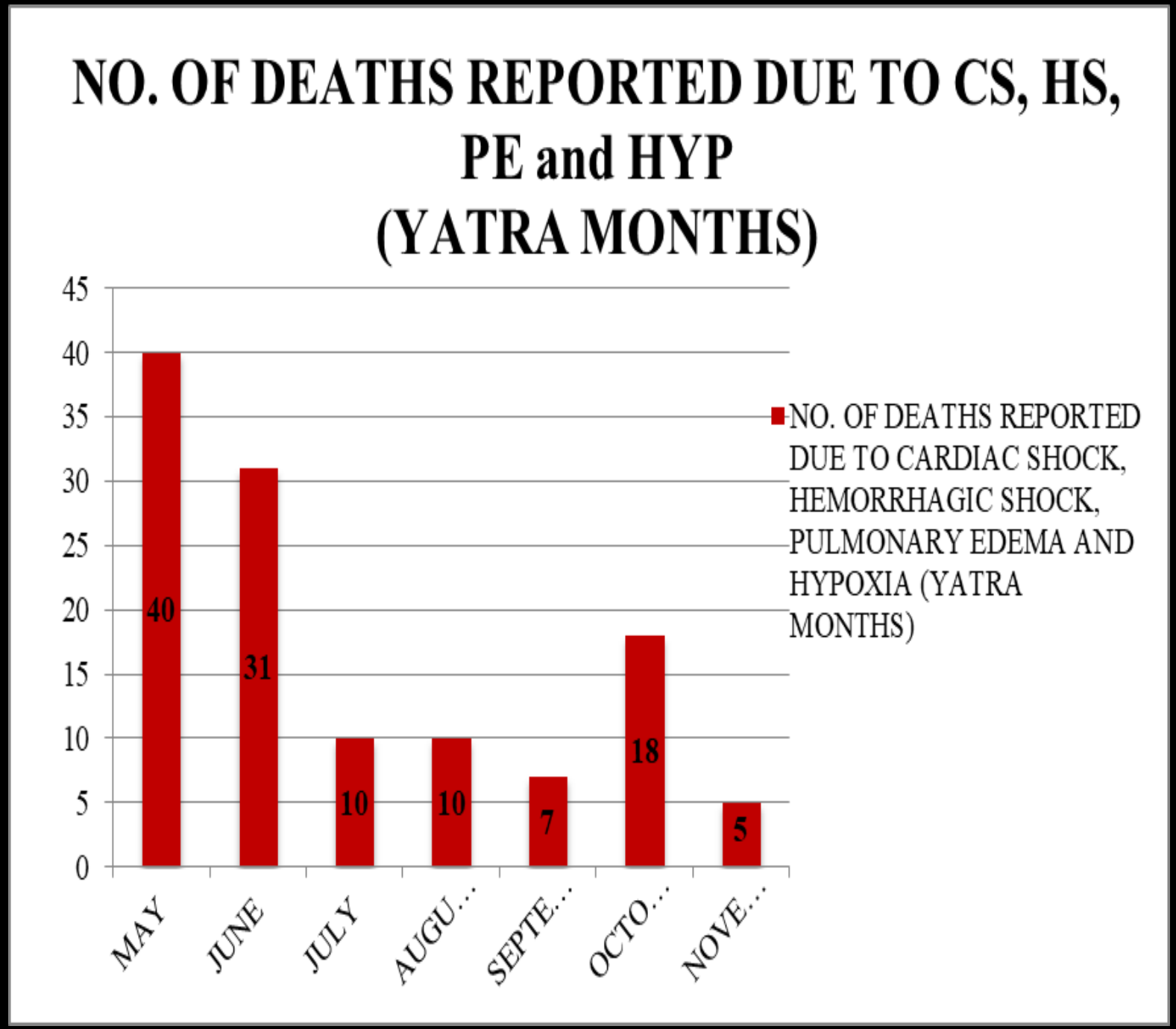


Figure 6: BAR GRAPH REPRESENTING THE MONTH-WISE DISTRIBUTION OF THE NO. OF DEATHS REPORTED DUE TO CS, HS, PE and HYP IN YATRA MONTHS (n_5=121)

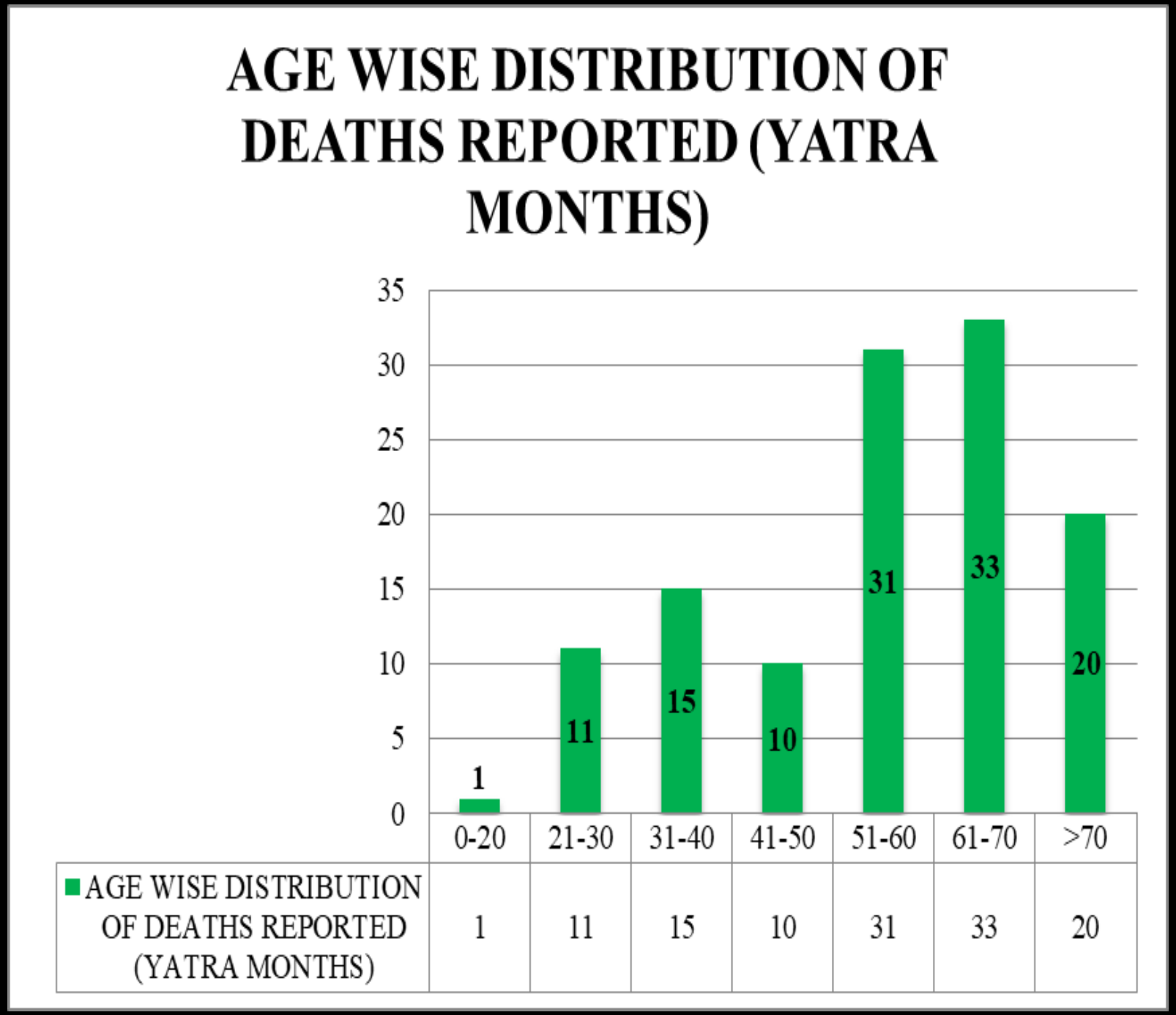


Figure 7: BAR GRAPH REPRESENTING DISTRIBUTION OF DEATHS REPORTED IN YATRA MONTHS DUE TO CS, HS, PE and HYP ACCORDING TO THE AGE GROUP (IN YEARS) (n_5=121)

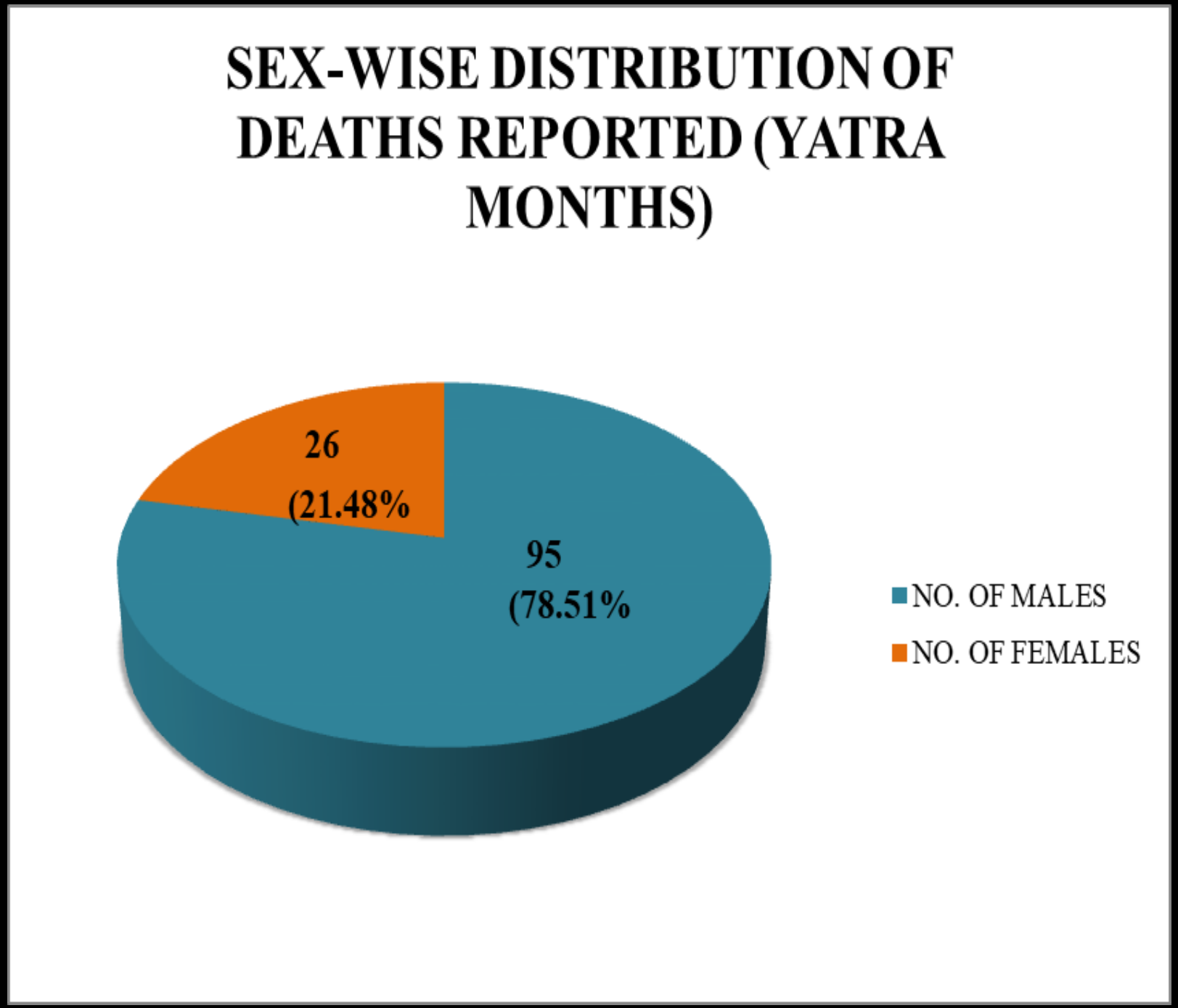


Figure 8: PIE CHART REPRESENTING DISTRIBUTION OF DEATHS REPORTED IN YATRA MONTHS DUE TO CS, HS, PE and HYP ACCORDING TO SEX (n_5=121)

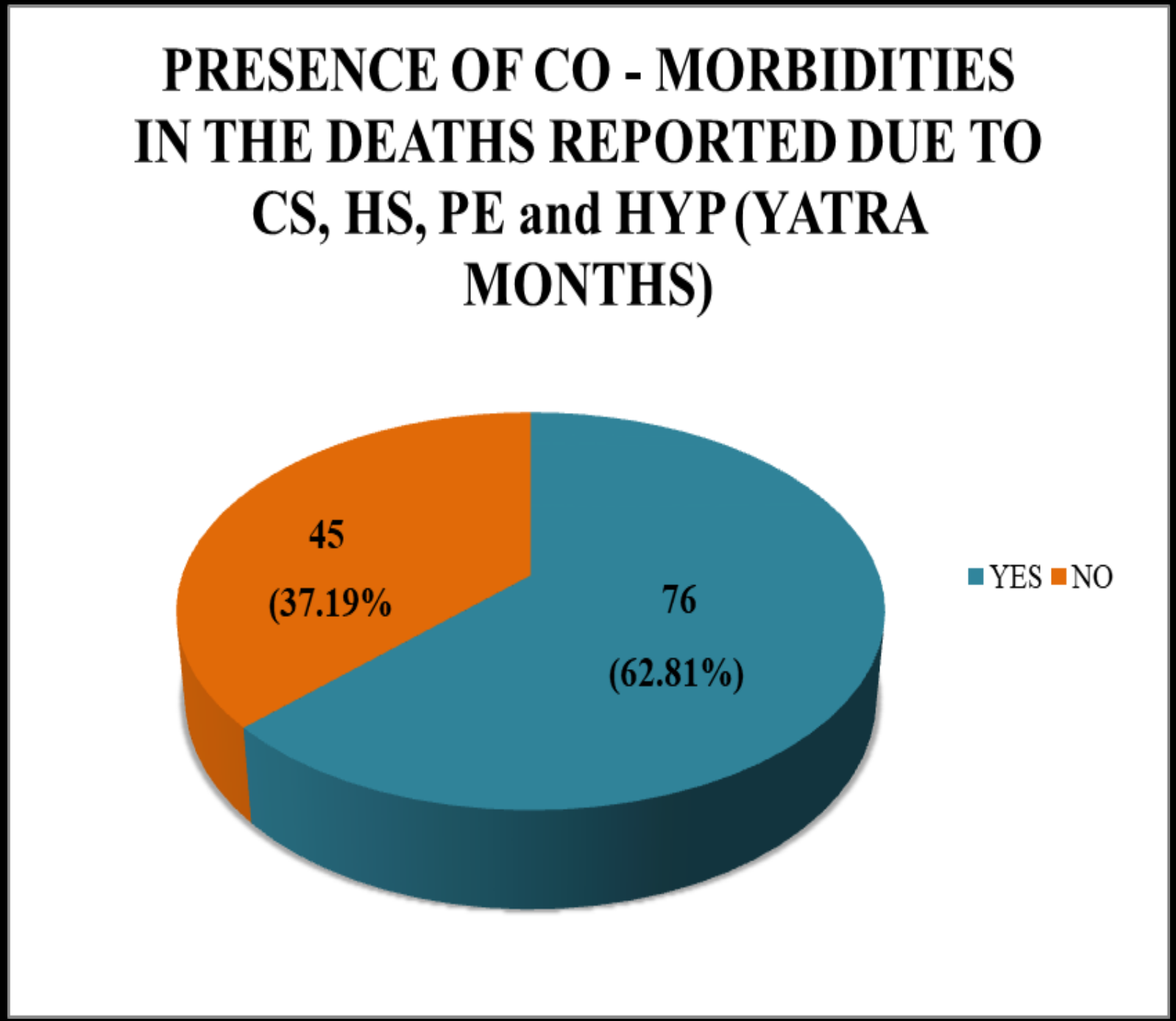
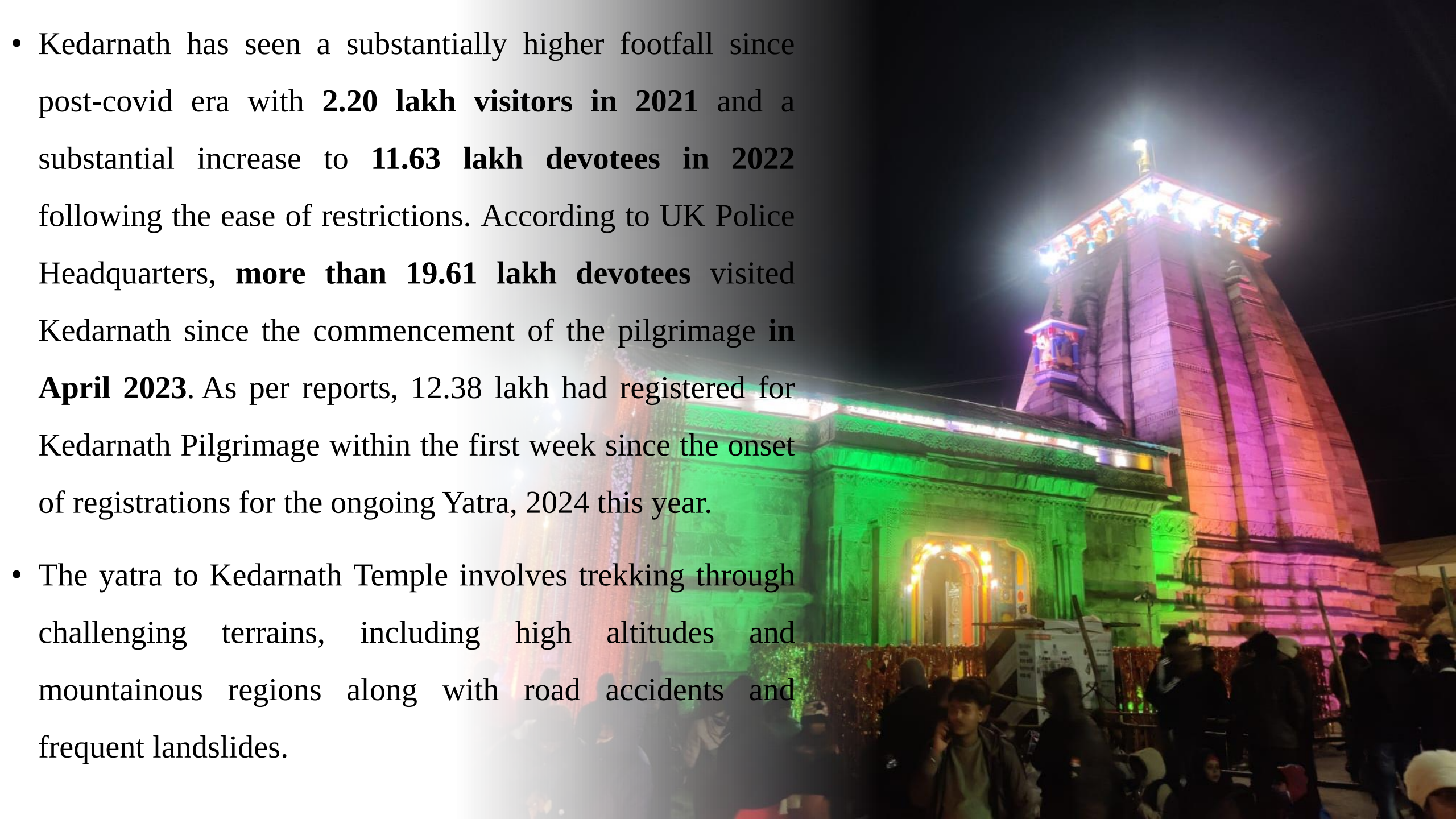
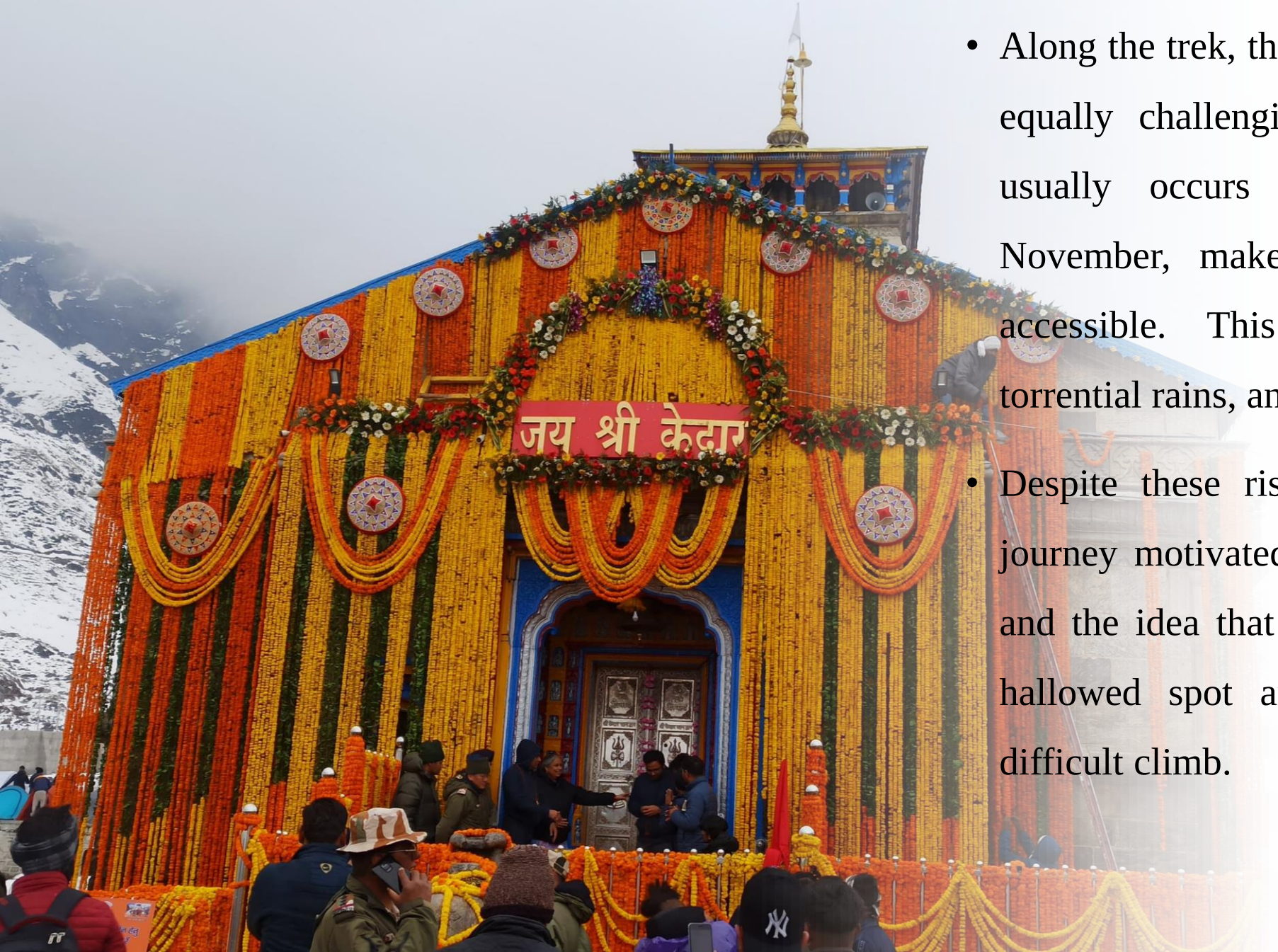


Figure 9: PIE CHART REPRESENTING THE DISTRIBUTION OF DEATHS REPORTED IN YATRA MONTHS DUE TO CS, HS, PE and HYP ACCORDING TO PRESENCE OR ABSENCE OF CO – MORBIDITIES (n_5=121)

CONCLUSION AND INTERPRETATION

- Kedarnath has seen a substantially higher footfall since post-covid era with **2.20 lakh visitors in 2021** and a substantial increase to **11.63 lakh devotees in 2022** following the ease of restrictions. According to UK Police Headquarters, **more than 19.61 lakh devotees** visited Kedarnath since the commencement of the pilgrimage **in April 2023**. As per reports, 12.38 lakh had registered for Kedarnath Pilgrimage within the first week since the onset of registrations for the ongoing Yatra, 2024 this year.
- The yatra to Kedarnath Temple involves trekking through challenging terrains, including high altitudes and mountainous regions along with road accidents and frequent landslides.





- Along the trek, the environmental conditions are equally challenging. Extreme weather, which usually occurs from late April to early November, makes the pilgrimage seasonally accessible. This includes heavy snowfall, torrential rains, and freezing temperatures.
- Despite these risks, pilgrims embark on this journey motivated by strong religious devotion and the idea that the blessings received at this hallowed spot are worth every step of the difficult climb.

ROAD TRAFFIC CASUALTIES PATTERN

MONTH-WISE DISTRIBUTION

- In the present study, it was observed that a total of 331 cases of road accidents were reported between April 2023 and March 2024. Out of these 331 cases, 84 (25.37%) were outlined during the months when the Kedaranath Yatra was non-operational while the remaining 247 (74.62%) cases were reported in the months when the yatra was operational. Thus, the number of RTA cases became almost thrice during the Yatra months (May 2023-November 2023).
- In analyzing the monthly distribution of road traffic accidents during the Yatra season, it was found that the highest number of incidents occurred in October (47; 19.03%), followed closely by May (40; 16.19%), while July recorded the lowest number of casualties (26; 10.52%).

AGE-WISE DISTRIBUTION

In our study the maximum number of road accidents were reported in the age group 20-29 (81; 32.47%) followed by 30-39 years (48; 19.43%). The age group that was reported to be the least affected by road traffic casualties was >60 years (9; 3.64%).

SEX-WISE DISTRIBUTION

In the present study it was noted that males highly outnumbered the females in case of road traffic accidents. The number of males who suffered road traffic casualties were 167 (67.67%) while females were relatively much lesser with total number of casualties recorded at 80 (32.33%).

MORTALITY PATTERN DUE TO CS, HS, PE AND HYP

MONTH-WISE DISTRIBUTION

- In the present study, it was observed that a total of 167 cases of deaths were reported between April 2023 and March 2024. Out of these 167 deaths, 46 (27.54%) were outlined during the months when the Kedarnath Yatra was non-operational while the remaining 121 deaths (72.45%) were reported in the months when the yatra was operational. Thus, the number of deaths became almost thrice during the Yatra months (May 2023-November 2023).
- the highest number of deaths were reported in the month of May (40; 33.05%) with June (31; 25.62%) coming a close second while the least number of deaths were reported in the month of November (5; 4.13%).

AGE-WISE DISTRIBUTION

In our study the maximum number of deaths due to cardiac shock, hemorrhagic shock, pulmonary edema and hypoxia were reported in the age group 61-70 years (33; 27.27%) followed by 51-60 years (31; 25.61%). The age group that was reported with the least number of deaths was 0-20 years (1; 0.82%).

SEX-WISE DISTRIBUTION

In the present study it was noted that females were outnumbered by males in case of mortality patterns observed due to cardiac shock, hemorrhagic shock, pulmonary edema and hypoxia during Yatra season. The number of males who died were 95 (78.51%) while females were relatively much lesser with total number of deaths recorded at 26 (21.48%).

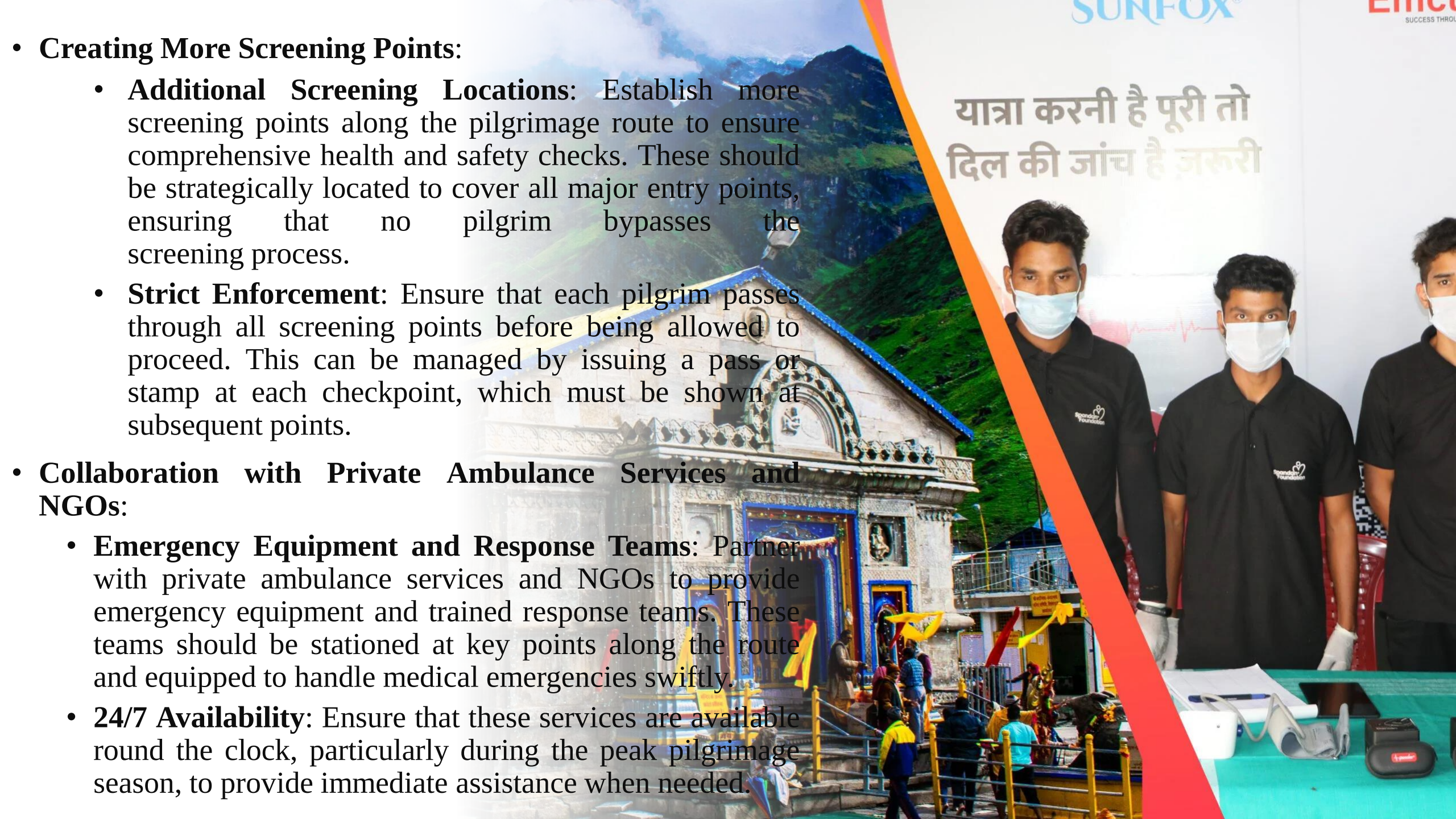
DISTRIBUTION BASED ON PRESENCE OR ABSENCE OF CO-MORBIDITIES

In the present study it was discerned that among the individuals who suffered death due to cardiac shock, hemorrhagic shock, pulmonary edema and hypoxia during Yatra season majority were suffering from previously diagnosed co-morbidities viz., hypertension, diabetes, asthma, k/c/o CAD to name a few. Out of 121 deaths registered during the Yatra season, 76 (62.81%) were reported in those suffering from various co-morbidities while a relatively lesser number of deaths i.e. 45 (37.19%) were reported in individuals with no previously diagnosed ailments.

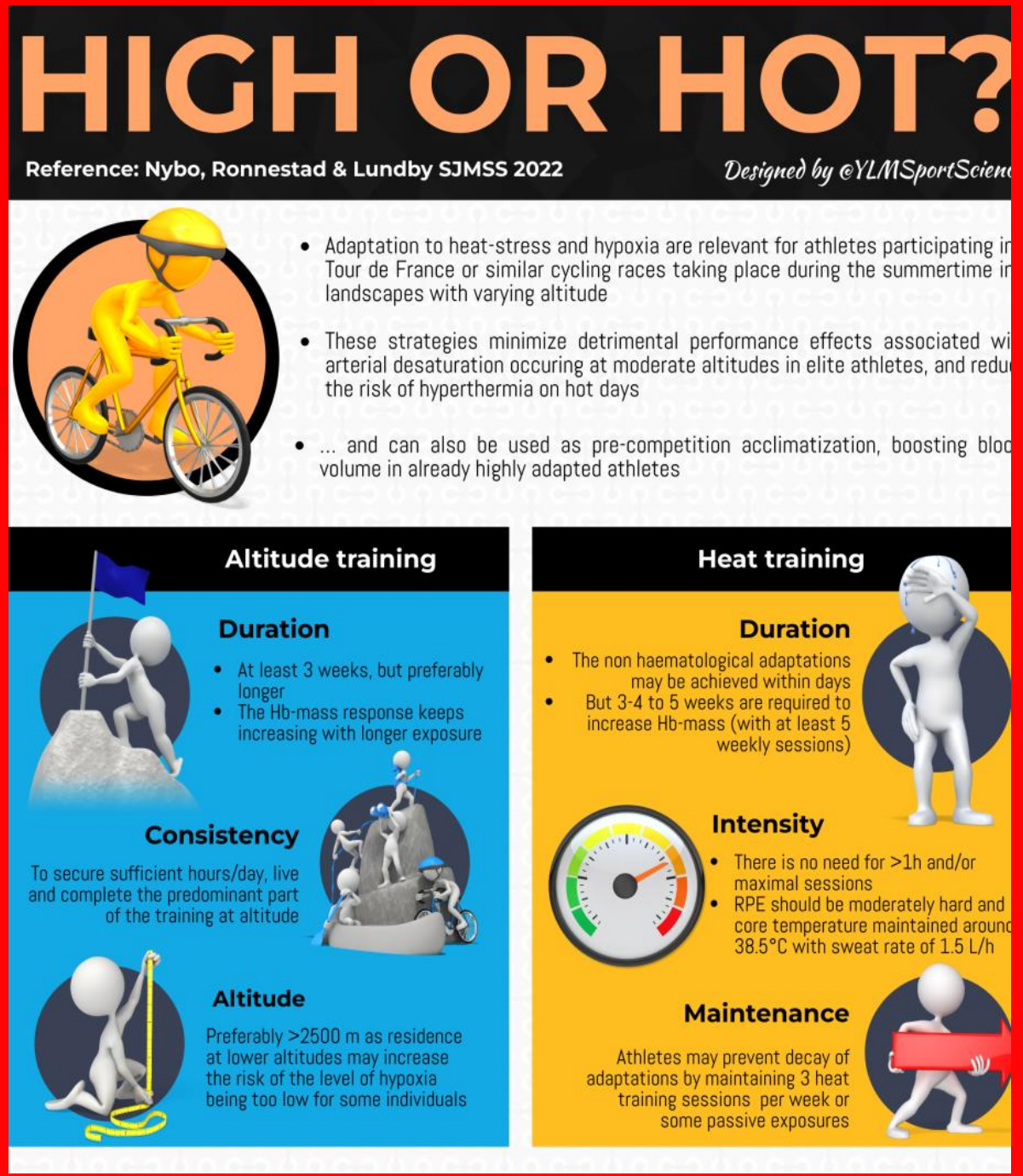
SUGGESTIONS

- **Controlling the Huge Influx of Pilgrims:**
  - **Permit System**: Implement a permit system that restricts the number of daily visitors. Pilgrims must apply for permits in advance, which can be allocated through an online system to ensure a controlled number of visitors.
  - **Time-Slot Allocation**: Allocate specific time slots for pilgrims to visit the shrine. This will help in managing the crowd more efficiently and prevent overcrowding at any given time.
  - **Advanced Registration:** Advanced registration systems can ensure that pilgrims plan their visit ahead of time and are aware of the allocated slots.
  - **Peak Season Management**: Implement restrictions during peak seasons and encourage visits during off-peak periods through incentives such as discounted travel and accommodation.

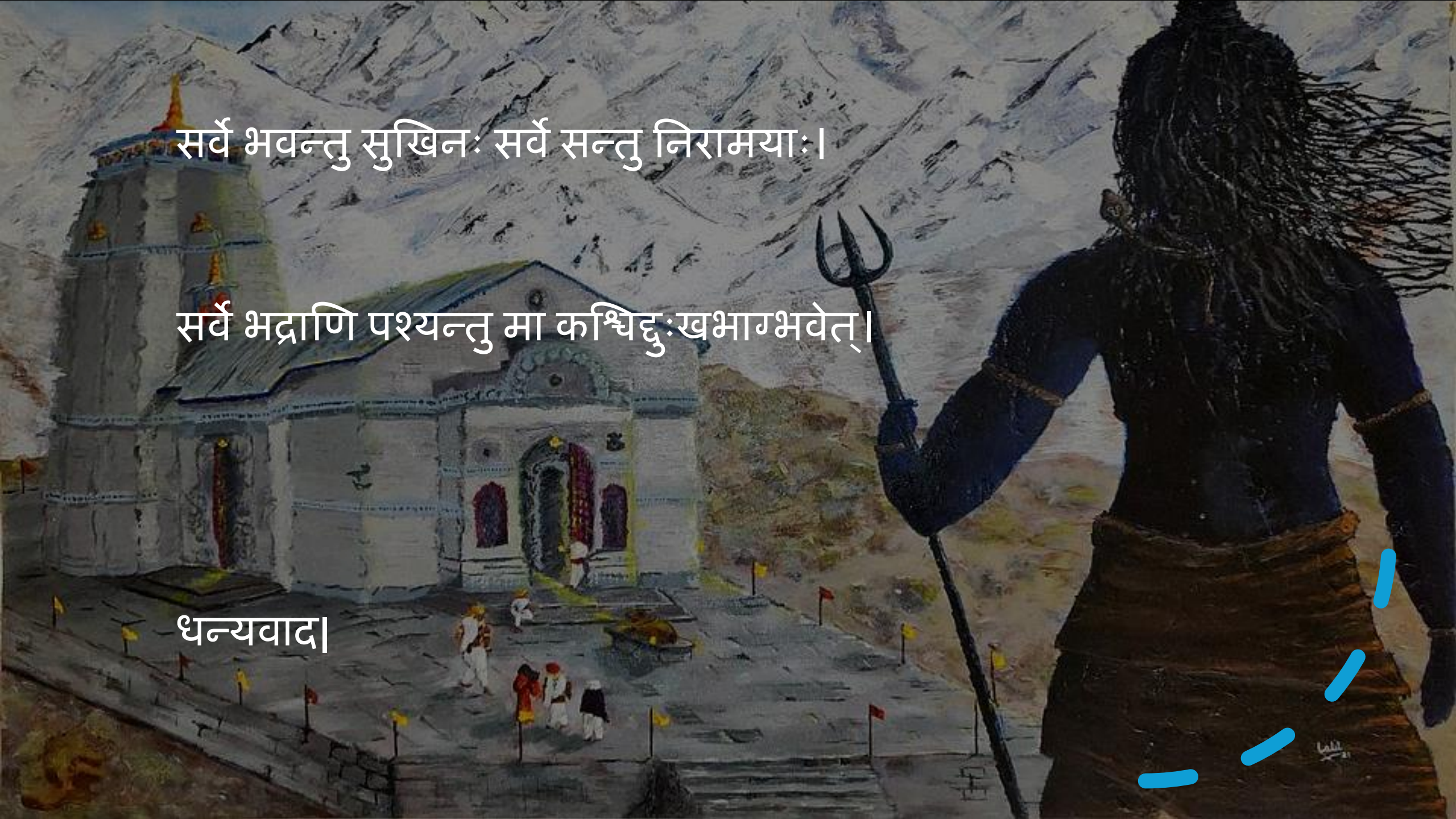
- **Creating More Screening Points**:
  - **Additional Screening Locations**: Establish more screening points along the pilgrimage route to ensure comprehensive health and safety checks. These should be strategically located to cover all major entry points, ensuring that no pilgrim bypasses the screening process.
  - **Strict Enforcement**: Ensure that each pilgrim passes through all screening points before being allowed to proceed. This can be managed by issuing a pass or stamp at each checkpoint, which must be shown at subsequent points.
- **Collaboration with Private Ambulance Services and NGOs**:
  - **Emergency Equipment and Response Teams**: Partner with private ambulance services and NGOs to provide emergency equipment and trained response teams. These teams should be stationed at key points along the route and equipped to handle medical emergencies swiftly.
  - **24/7 Availability**: Ensure that these services are available round the clock, particularly during the peak pilgrimage season, to provide immediate assistance when needed.



- **Enhanced Peak Season Management**:
  - **Road Safety Measures**: Implement strict road safety protocols, including the deployment of additional traffic personnel, installation of safety barriers, and regular maintenance of roads and trekking paths.
  - **Health Monitoring**: Increase the presence of medical personnel during peak seasons and set up additional health camps along the route. These camps should offer services like oxygen supplies, first aid, and basic medical treatment.
- **Mandatory Pre-Acclimatization Training**:
  - **Training Programs**: Introduce mandatory pre-acclimatization training for all pilgrims, with special emphasis on vulnerable groups such as the elderly and those with pre-existing health conditions. These programs should educate pilgrims on the risks of high altitude and the importance of gradual acclimatization.
  - **Special Safety Kits**: Provide special safety kits to vulnerable groups. These kits should include essential items like oxygen canisters, first aid supplies, and informational pamphlets on recognizing symptoms of altitude sickness.



- **Awareness Campaigns and Research**:
  - **Public Awareness**: Launch extensive awareness campaigns using various media platforms to educate pilgrims on the importance of health and safety measures. These campaigns should highlight the need for proper preparation and the risks associated with high-altitude treks.
  - **Continuous Research**: Conduct ongoing research to collect data on health incidents, accidents, and overall pilgrimage trends. This data can be used to refine strategies and improve safety measures continuously.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