

# Outbreak of Gastroenteritis Among Riyadh Female Long-Term Elderly Care Facility Residents-Saudi Arabia, January 2023

Khalid Khalfan Alnair<sup>1</sup>, Shady Kamel<sup>2</sup>, Abdulaziz S. Almeshal<sup>2</sup>

<sup>1</sup>Family and Community Medicine, College of Medicine, King Saud University, Riyadh, Saudi Arabia

<sup>2</sup>Field Epidemiology Training Program, Saudi Ministry of Health, Riyadh, Saudi Arabia

## Email address:

alnairkhalid@gmail.com (Khalid Khalfan Alnair)

## To cite this article:

Khalid Khalfan Alnair, Shady Kamel, Abdulaziz S. Almeshal. Outbreak of Gastroenteritis Among Riyadh Female Long-Term Elderly Care Facility Residents-Saudi Arabia, January 2023. *International Journal of Gastroenterology*. Vol. 7, No. 2, 2023, pp. 40-48.

doi: 10.11648/j.ijg.20230702.11

**Received:** June 20, 2023; **Accepted:** July 6, 2023; **Published:** July 27, 2023

---

**Abstract:** *Background:* The female long-term elderly care facility in Al-Riyadh is affiliated with the Ministry of Human Resources and Social Development, with a maximum capacity of 60. Between January 29, and February 3<sup>rd</sup>, 2023, the local public health authorities were notified of a potential gastrointestinal illness (AGE) outbreak involving 15 residents and 4 staff members. *Objective:* Investigate the outbreak, implemented infection control measures, and infection risk factors in a female (LTCF) in Riyadh. *Methods:* A laboratory, environmental investigation, and retrospective cohort study were conducted, including 54 residents and descriptive data on 27 employees. The data were collected from clinical histories and through a survey by questionnaire. *Results:* A total of 19 cases of which 15 (79%) female residents, 3 (16%) staff nurses, and one (5%) female worker at the kitchen had been ill with AGE, corresponding to an overall attack rate of 11% and 28% among the residents. And 3 (16%) being managed as outpatient and 1 (5%) being admitted. No deaths occurred among the affected cases. The Cases ranged from 51-91 years (median: 64 years). The main reported symptoms were vomiting (86.6%), diarrhea (60.0%). Living on the first floor and in unit 3 was associated with a higher risk of developing AGE (RR 3.7, 95% CI 1.2-11.7) and (RR 3.3, 95% CI 1.6 - 7.0) with a P value of 0.01, respectively. Stool analysis and culture for 4 resident cases were negative. Food and water samples were also negative. *Conclusion:* We concluded that the source of outbreak was not identified as no sample had taken from patients or the prepared food on same day. While it cannot be proven with certainty, this investigation suggests that the outbreak may have originated from food, highlighting the importance of implementing food safety protocols in institutional care facilities. Public health agencies should investigate these outbreaks to uncover any problems with food handling or other possible causes.

**Keywords:** Gastrointestinal Illness, Long-Term Elderly Care Facility, Al-Riyadh

---

## 1. Introduction

Riyadh region is the capital city of the Kingdom of Saudi Arabia (KSA), with a population of approximately 8,002,100, and it is located in the center of the KSA [1]. The number of those between 65-79 years old has reached more than 75 thousand, while those over the age of 80 and above reach more than 15 thousand. The percentage of the total Saudi elderly (65 years or more) was 4.2% of the total Saudi population and %19.5 of this age group in Riyadh for 2019 [2]. The proportion of those suffering from chronic diseases

were 74.1% of for the year 2018 [2]. In 2021, there have been 22 FBDOs in Riyadh, 17 of which have been linked to public sources, with the remaining five linked to home sources, for a total of 89 cases recorded [3]. There is 12 Houses of Social Caring for the Aged in KSA both for males and females accompanying 373 males and 219 females according to 2019 statistics [4].

Older people living in care homes need to be Providing specialized healthcare support, with and without nursing, is a growing global concern. This population is expanding and has complicated demands, yet providing the essential

healthcare support is a controversial topic from an organizational perspective [5]. Residents at long-term care facility residents (LTCF) eat together and use the same entertainment and therapeutic buildings. Additionally, they are very reliant on medical professionals for help with daily tasks including showering, using the restroom, dressing, eating, and moving around. With regular patient transfers between the nursing home and hospital and numerous opportunities for MDROs and *C. difficile* to spread from one setting to the next, the two types of facilities are inexorably linked. Elderly patients who are hospitalized might pick up drug-resistant infections, which they then move to nursing homes where they serve as reservoirs and sources of transmission for other patients [6]. The older adult population suffers from increased rates of hospitalization and higher case fatality rates compared to the younger population [7]. This population has a variety of demands, many of which are caused by chronic, progressive illnesses such as cardiorespiratory, musculoskeletal, and neurodegenerative disorders. Deficits in vision and hearing are frequent, and the elderly generally have dementia and about 40% of residents are depressed [8]. Moreover, due to age-related immunosenescence, cognitive and functional impairment, and multiple co-morbid diseases, manifestations of infectious diseases are variable amongst older adult populations [6]. Care facilities across the world form diverse congregant settings with substantial differences in the dependency level of the residents and provision of wide variety of services with or without delivering skilled nursing care [5]. The gathering of residents, healthcare professionals, and visitors in settings like aged care facilities contributes to an increased risk of disease transmission, making the control of an outbreak with non-pharmacological interventions difficult [9].

Viral gastroenteritis is usually a self-limiting illness and several viruses may cause outbreaks but norovirus and rotavirus are by far the most common. Norovirus can spread quickly in enclosed places like daycare centers, nursing homes, schools, and cruise ships and there were an estimated each year, norovirus causes 19 to 21 million cases of acute gastroenteritis in the U. S. [10]. The prevalence of Rotavirus among AGE cases in older adults  $\geq 60$  years of age varied between 0% and 62%, with results differing by country [11]. Infection with acute gastroenteritis is spread through contact with an infected person or contaminated environmental surfaces, or through eating or drinking contaminated food or water [12].

#### *Objectives*

The following were the major goals of our investigation:

1. Investigate the outbreak, infection control measures implemented, and infection risk factors in a female long-term elderly care facility (LTCF) in Riyadh.
2. To assess the severity and the extent of the current AGE.
3. To identify the possible risk factors.
4. Determine the cases' major epidemiological characteristics.
5. Determine appropriate control measures to prevent such outbreaks in the future.

## **2. Material and Methods**

### **2.1. Outbreak Notification**

On January 29, 2023, a patient from a Riyadh female long-term elderly care facility (LTCF) was transferred to a local hospital for treatment, and the local public health authorities were notified of a potential AGE outbreak involving 11 residents and one staff member. The onset of AGE in the first cases started on the afternoon of January 24. Nausea, vomiting, and watery diarrhea without blood or fever were the predominant symptoms. When the suspected outbreak was notified, some affected individuals were already recovering, and four patients were referred to the hospital, where one only required hospitalization. The center's doctor advised putting those residents in isolation rooms. On the 31<sup>st</sup> of January, the field epidemiology training program (FETP) team visited the facility and reviewed the clinical presentation and possible exposures; the team also conducted an environmental investigation. Second visit was conducted in 5<sup>th</sup> February 2023 to interview the staff nurse and worker. We found that 3 of nurse staff got same symptoms of vomiting and diarrhea started on 2<sup>nd</sup> February and were treated at home.

### **2.2. Outbreak Setting**

The female long-term elderly care facility in Al-Riyadh is affiliated with the Ministry of Human Resources and Social Development. The care home had 54 female residents distributed across eight units on three floors, with a maximum capacity of 60. The home had been running for several years since 1982; the structure and facilities were sufficient for its declared activity, and the resident population was less than the maximum capacity. Residents were not distributed systemically but those with highest degree of dependency (10 resident) were put in the ground floor as ICU room, (28 resident) residents on the first floor and the rest (16 resident) on the second floor. The home had 123 as a private company staff and 52 governmental staff: 54 work as personal caregivers (two shifts), 18 as medical staff (15 nurse, three shifts of 5, 2 physiotherapists, and 1 dental assistance) and 12 as bedridden technicians. The remaining 42 staff were assigned to maintenance, laundry, and cleaning; kitchen; driving; and security. The center had a kitchen and three rest rooms on each floor that were used by patients admitted to all floors. On the third floor, there was an isolation room for patients who suspected they had an infection. The administration offices were on the ground floor, while the nursing station was on the first floor.

Different menus (such as those for regular diets, diabetics, easy chewing, soft foods, and low-calorie diets) were prepared based on the characteristics of the individual, although only the soft food menu really varied from the others.

### **2.3. Case Definition**

A case of gastroenteritis was defined as any person working or residing in the nursing home during the January 24, to February 2, 2023 who had an episode of acute diarrhea ( $\geq 3$  times per day) or vomiting, or two or more of the following signs: fever, abdominal pain, and nausea.

The investigated subjects included resident and staff in the based elderly nursing home. Suspected case was defined by the onset of vomiting or diarrhea ( $\geq 3$  times per day) in the home since January 24, to February 2, 2023. No Laboratory confirmed case was obtained from the stool or vomit specimen of suspected case tested.

#### 2.4. Study Design

A retrospective cohort study was conducted among resident to test the risk hypothesis and descriptive study for staff in center. The study was carried out on January 31, February 2<sup>nd</sup>, and 5<sup>th</sup> was aimed at verifying the etiology and mechanism of the outbreak. A Saudi ministry of health standardized questionnaire was used to collect data. Care plans, progress notes, and medication sign-off sheets were reviewed. The number of cases in different rooms and floors was divided by the total number of non-cases outside rooms and floors to calculate the attack rate (AR) and by comparing the existence of cases and non-cases in different rooms and floors, to calculate risk ratios (RR) and 95% confidence intervals (CI). The data were inputted by EXCEL v360 (Microsoft) and analyzed by SPSS v23.0 software (SPSS Inc., Chicago, IL, USA). P value was two-sided and  $p < 0.05$  was considered statistically significant.

#### 2.5. Epidemiologic Investigation

The cases were identified by passive surveillance through hospital reports and by active surveillance through field visits and interviews with all resident's care giver and staff to find more cases. But we could not interview residents because they have communication problems since they have mental retardation, cerebral palsy, or aphasia. An epidemiological survey was designed to gather socio-demographic data, symptom onset and end and clinical data. A food survey was conducted to determine the type of menu and the specific dishes consumed. The questionnaire was filled out by two residents of FETP with help from the center's health staff. Therefore, the data collection instrument used in this investigation was a FBDO questionnaire that has already been developed by the MOH (Appendix 3) and converted to an electronic Google Form to create the line list. In addition to quantify the size of the outbreak, monitoring its evolution, and maintaining the control measures indicated.

#### 2.6. Laboratory Analysis

Four sick residents were referred by the center doctor to nearby hospitals. two of them were referred to King Khalid University Hospital (KKUH), one to King Suliman Hospital, and one to Dreya Hospital. In the hospital, the stool culture and nasal swap were done for the patients. Given the suspicion of bacterial AGE, viral tests were not carried out. Unfortunately, rectal swabs and vomit samples from cases, rectal swabs from canteen employees, and retained food samples were not collected.

#### 2.7. Environmental Assessment

The team from MOH, the municipality, and the Saudi

Food and Drug Authority visited the center on January 29, and collected environmental samples from the kitchen, water, and common use areas surface. The team closed the kitchen on January 29, 2023, based on response and processing advice priorities. Our team inspected the food-handling facilities, including the kitchen, and observed how food is prepared and distributed to the units. Our investigation team assessed four dimensions:

1. General examination: The team examined the building and kitchen's structural integrity through direct observation of lunch preparation, kitchen temperature checks, and functional hygiene. Pests and insects were also looked for during the sanitary investigation.
2. Caregivers, cleaners, and Food handlers; clinical history was taken. A one-week history of AGE, upper respiratory infection, or jaundice was obtained from them. They were asked about the preparation and handling of foods and about handwashing and other practices. The team examined the application of infection controls and the validity of the health certificates.
3. Food items: Canned and dry food was kept in the center store, but meat and chicken were supplied daily to the center. No leftover food was found.
4. Equipment and utensils; the team examines the refrigerators, thermometers, blenders, trollies etc.

During the outbreak, we copied the usual meal list for each meal (Table 2) because we were unable to get the meals and food items from residents and their caregivers.

## 3. Results

### 3.1. Descriptive Epidemiology

#### 3.1.1. Distribution of Cases by Person

All 54 female Saudi residents, 22/118 (18.6 %) workers, and 5/15 (33 %) staff nurses answered symptom questionnaires. The resident patients were between the ages of 51 and 91 (median (IQR): 64 (59-72) years). The number of cases were 19, with 15 (79%) female residents, 3 (16%) staff nurses, and one (5%) female worker at the kitchen. Overall attack rate was 11% (19 / 175) and 27.4% among resident. No other related cases were detected in family relatives. Among the residents all the cases among residents were Saudi. The cases among staff nurses and workers were 2 (50%) Saudis. Overall, 26 of 54 residents (48%) had at least 1 serious chronic medical condition, 29 (54%) cognitive impairment, and 19 (35%) bedridden (Table 1). There were 67% of case were DM, 46.7% mental retardation, 33.3% in both HTN and the bedridden (Figure 1). Of the 54 facility residents, 15 experienced AGE symptoms with attack rate of 27.8%, with four being referred to the hospital and one only staying for two days (Figure 2). No deaths occurred among affected residents. There were 53.7% of cases less than 65year and 37.6% aged more than 65 years (Figure 3). The main reported symptoms of the resident cases were vomiting (86.6%), diarrhea (60.0%), nausea (40.0%), fever (13.3%), and abdominal pain (6.6%) (Figure 4). Of the 27 worker and staff nurses who completed a questionnaire, 4 (15%) reported illness symptoms,

including vomiting (4 [15%]); diarrhea (4 [15%]), and abdominal pain (2 [1%]).

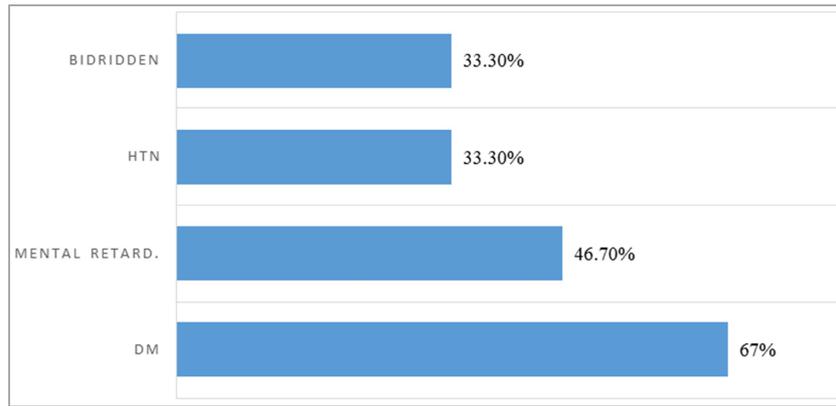


Figure 1. Distribution of Resedint cases according to comorbidity of AGE outbreak in riyadh female LTCFs-saudi arabia, jan 2023.

Table 1. Demographic Characteristics and Reported Symptoms.

Characteristics	No. (%)	
	Residents (n=54)	Staff (n=27)
Age, median (IQ), years	64 (11.2)	35.0 (6)
Female sex	54 (100)	27 (100)
No symptoms	39 (72)	23 (85)
Any symptoms	15 (28)	4 (15)
Referred to hospital	4 (7.4)	0/27 (0)
admitted	1 (1.8)	0/27 (0)
Specific symptoms		
Vomiting	13/54 (24)	4/27 (15)
Diarrhea	9/54 (17)	4/27 (15)
Nausea	6/54 (11)	4/27 (15)
Abdominal pain	1/54 (2)	2/27 (1)
Fever	2/54 (4)	0/27 (0)
Pre-existing medical conditions		
Bedridden	19/54 (35)	0/27 (0)
Diabetes mellitus	23/54 (43)	0/27 (0)
Hypertension	18/54 (33)	0/27 (0)
Cognitive impairment	30/54 (56)	0/27 (0)
Another comorbidity	21/54 (39)	0/27 (0)
NGT	3/54 (6)	

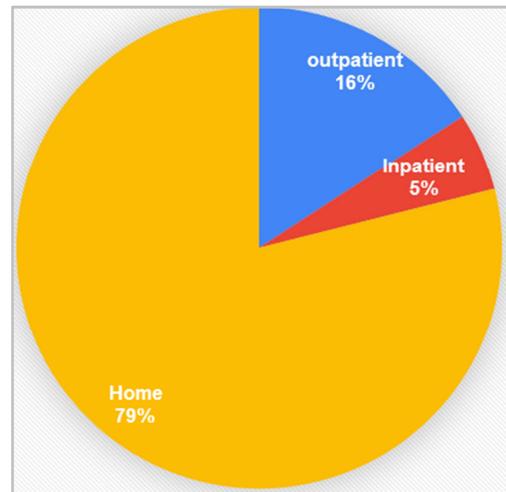


Figure 2. Distribution of cases according to severityof acute gastroenteritis outbreak in Riyadh Female Long-Term Elderly Care Facility Residents - Saudi Arabia, January 2023.

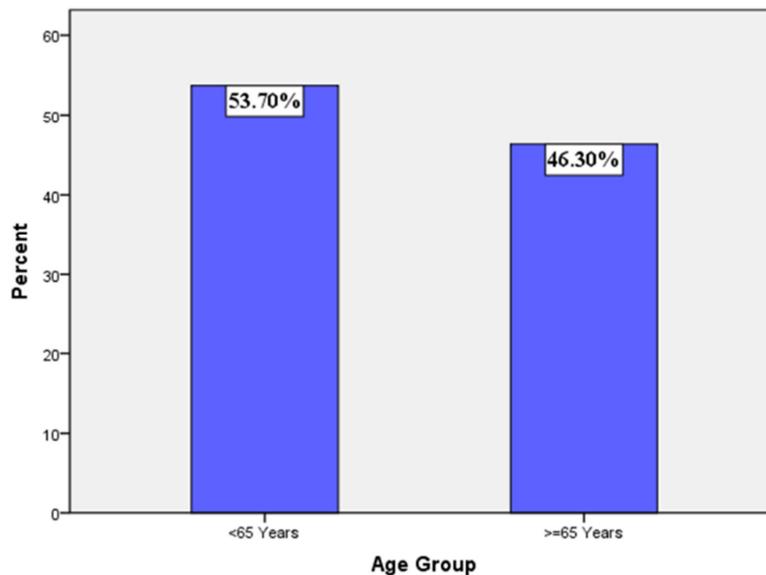


Figure 3. Distribution of cases by age groups of acute gastroenteritis outbreak by date of onset of symptoms of cases in Riyadh-female long-term elderly care facility, Saudi Arabia 2023. (n=19).

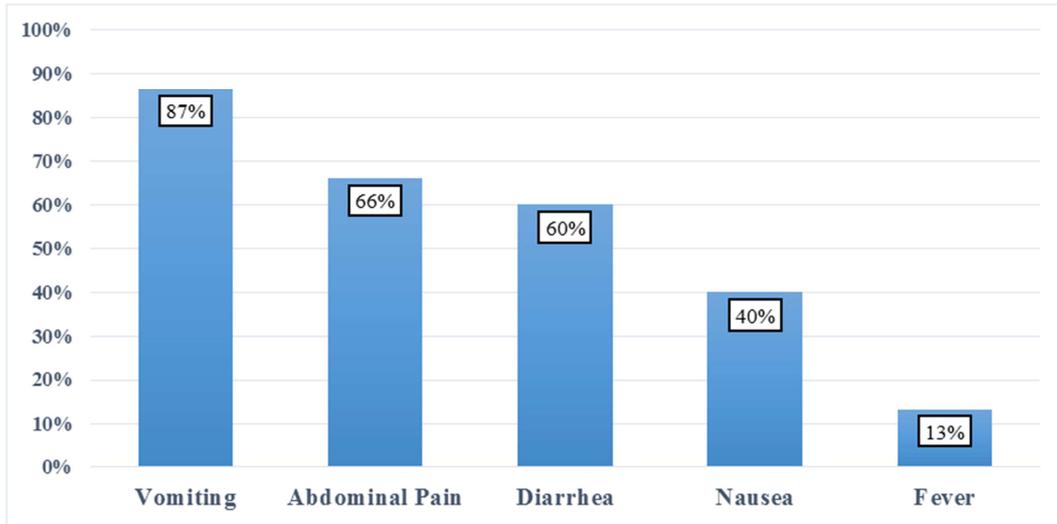


Figure 4. Distribution of patients according to presenting symptoms of acute gastroenteritis outbreak in Riyadh Female Long-Term Elderly Care Facility Residents -Saudi Arabia, January 2023.

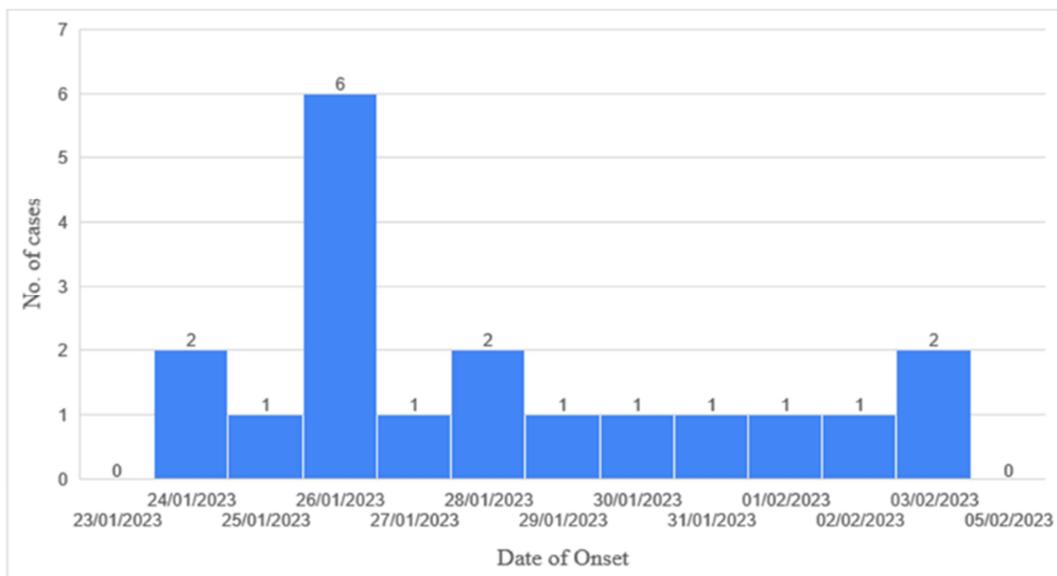


Figure 5. Epidemic curve of acute gastroenteritis outbreak by date of onset of symptoms of cases in Riyadh-female LTCFS, Saudi Arabia 2023. (n=19).

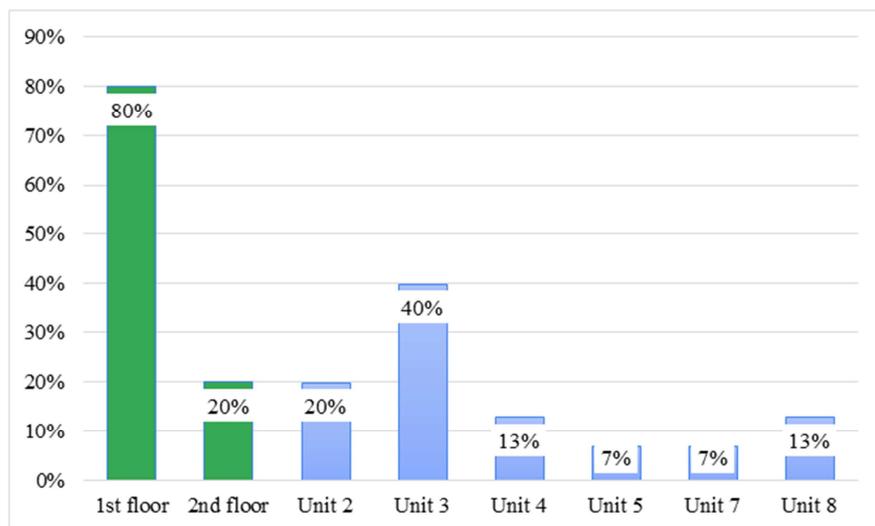


Figure 6. Distribution of Residents cases according to place in Riyadh Female Long-Term Elderly Care Facility Residents -Saudi Arabia, January 2023.

### 3.1.2. Distribution of Cases by Time

The outbreak lasted for 11 days, beginning on January 24. The high-peak occurred on January 26, and the illness continued for 1 to 4 days (median=1 day) according to the epi curve (Figure 5). There were no further cases reported after February 3<sup>rd</sup>. The epi curve showed a point-source pattern.

### 3.1.3. Distribution of Cases by Place

Cases were widely distributed on the first and second floors, as well as throughout nearly all 6/8 apartment buildings. There were 12 (80%) of the cases on the first floor (Figure 6). The referred cases to the hospital were 4 (21%), and 1 (5%) was admitted. The attack rate on the 1<sup>st</sup> floor was 42.9% (12/28), and the 2<sup>nd</sup> floor attack rate was 18.8% (3/16). The attack rate was 66.7, 50, and 50% in units 3, 5, and 8,

respectively.

### 3.2. Analytical Epidemiology

a retrospective cohort study of the residents was conducted who were at center during the outbreak to identify the relationship between being on various floors or units in order to confirm that being on the floor or in a unit was a high-risk factor. During bivariate analysis, the risk of developing AGE among those who were residing on the first floor was (RR 3.7, 95% CI 1.2-11.7) with a P value of 0.01 compared with the other floors. Living in unit 3 was associated with a higher risk of developing AGE (RR 3.3, 95% CI 1.6 - 7.0) with a P value of 0.01 compared with other units. Diabetic residents were more likely to develop illness (RR 2.7, 95% CI 1.1 - 6.8) (Table 2).

**Table 2.** Attack rates and risk ratios of gastroenteritis among Riyadh Female Long-Term Elderly Care Facility Residents -Saudi Arabia, January 2023.

Place	Exposed			Non-exposed			RR	95%CI	P
	Total	Ill	AR%	Total	Ill	AR%			
1 <sup>st</sup> floor	28	12	42.9	26	3	11.5	3.7	1.18-11.69	0.01*
2 <sup>nd</sup> floor	16	3	18.8	38	12	31.6	0.6	.19 - 1.82	0.51
Unit 2	9	3	33.3%	45	12	26.7%	1.3	.44 - 3.55	0.68
Unit 3	9	6	66.7%	45	9	20.0%	3.3	1.58 - 7.02	0.01*
Unit 4	8	2	25%	46	13	28.3%	0.9	0.24 - 3.19	1.0
Unit 5	2	1	50%	52	14	26.9%	1.9	0.46 - 8.59	0.45
Unit 7	8	1	12.5%	46	14	30.4%	0.4	.06 - 2.7	0.42
Unit 8	4	2	50%	50	13	26.0%	1.9	.72 - 6.4	0.26
DM	23	10	43.5	31	5	16.1%	2.7	1.1 - 6.8	0.028*
Bedridden	19	5	26.3%	35	10	28.6%	0.9	0.37 - 1.45	0.8
Total resident	54	15	27.7%						

### 3.3. Laboratory Investigation

Hospitalized patient was investigated for MRSA, Candida auris, Influenza, Corona MERS, COVID-19, and RSV, all of which came back negative. The stool culture samples tested from the patients were negative for bacteria, but the CBC showed lymphopenia. There were no other samples taken from food handlers, or caregivers. Of the six samples taken from the suspected foodstuffs submitted for testing, no microbial organism was detected.

### 3.4. Environmental Hygiene Investigation

Three environmental samples were collected (one from the kitchen, one water sample, and one from rest areas of the residence). No environmental sample was positive for any microbes. The building and kitchen's floor, containers, and tables were all clean, and a kitchen insect lamp was also present. The food supplies were stored in a clean store near the kitchen. The kitchen was clean, disinfected, and free of insects or rodents. The facility had a daily follow-up list with the dietician supervisor to apply cleanliness and food safety regulations. The truck temperatures loaded with foodstuffs are recorded before downloading them in the kitchen, and the food will be served and cooked daily without being refrigerated again.

The meals were Prepared and held in the kitchen at same

building. direct observation of lunchtime meal processing and preparation indicated poor food handling standard. The Minimum core Temperatures for hot meals were not frequently verified to confirm a temperature of 75.8°C. Hot foods that are not directly assembled are not maintained in a warmer set to a minimum temperature of 60.8°C. After assembly, all meals were placed in trays covered with a lid before being transported to residential units on an open un-warmer trolley. There was around a 40-minute duration between the start of on-site preparation of meals for serving and service to residents. After food arrives at each floor, we estimate it will take approximately 5 minutes before each resident is fed. According to caregivers, most residents are fed by hand, and each feeding takes about 10 minutes per resident according to daily menu (Table 3). Residents who were in NGT feeding were given ready-made ensure milk. Governmental facility water supply was the center's source of water supply and was used for cooking and daily resident care. Drinking water mode was the primary drinking brand of bottled water. Kitchen refrigerators were kept at safe temperatures. A temperature monitoring sheet was posted in each refrigerator; the thermometers on all three refrigerators in the female kitchen preparatory area were at the recommended 4.4°C. (Table 4). The yoghurt and milk are kept in a fridge at 2.5°C (the Saudi Food and Drug Authority SFDA recommends 4°C). The resident who stays in same

units, they shared the toilet lived together and eat their food in the off-beds tables.

**Table 3.** Copy of Meals of Riyadh Female Long-Term Elderly Care Facility Residents-Saudi Arabia, January 2023.

Symptoms Onset Date	Breakfast	Lunch	Dinner
23/01/2023	Lentils, Egg, cheese triangles, Jam, Bread, Milk, tee	Rice, Vegetables, Meat, Salad, Soup	Rice, Meat, Vegetables, Salad, Bread, Fruits, laban, Yougert
24/01/2023	Egg, Lentils, cheese, Jam, Bread, Milk, Tea	Bread, Rice, Vegetables, Chicken, Salad, Fruits, Laban, water	Rice, chicken, Soup Vegetables, Salad, Bread, Yogurt
25/01/2023	Beans, Eggs Shakshuka, Cheese triangles, Jam, Bread, Milk, TEA	Bread, Rice, Fish, Salad, Fruits, Laban, Yogurt, water	Rice, Chicken, Macaroni, Egg, Salad, Bread, Fruits
26/01/2023	Bean, Egg, Labneh, Jam, cheese triangles, Bread, Milk, tea	Rice, Vegetables, Chicken, Salad, Soup Fruits, Laban, water	Eggs, White cheese, The sweetness of flour, macaroni, Juice, Bread
27/01/2023	Tonna Salad, Egg, slide cheese, Jam, Bread, milk, water	Rice, Vegetables, Chicken, Salad, Juice, Laban, yogurt	Macaroni, Chicken, Vegetables, Salad, Bread, Fruits
28/01/2023	Lentils, Eggs, Labna Zaytoon, cheese triangles, Tea, Water, Milk	Rice, Vegetables, Chicken, Salad, Fruit, Laban, Juice, Water	Rice, Chicken, Salad, Bread, Yogurt, juice
29/01/2023	Lentil, cheese kary, Jam, qeshta, Bread, Milk, tea	Rice, Vegetables, Chicken, Salad, Soup, Juice, water	Rice, Chicken, Vegetables, Salad, Bread, yogurt, water
30/01/2023	Broad Bean, White cheese, the sweetness of flour, Bread, Milk	Bread, Rice, Vegetables, Chicken, Salad, Fruits, Laban	Beans, tuna, Eggs, Juice, Bread

**Table 4.** Refrigerators Temperature During the Jan 24 Visit of the FETP team in Riyadh Female Long-Term Elderly Care Facility Residents-Saudi Arabia, January 2023.

Refrigerator	Measured Temperature Jan 24.
Chicken refrigerator	-12°C
Meat Refrigerator	-15°C
Raw vegetable refrigerator	16°C
Yoghurt and milk refrigerator	-2.1°C

## 4. Discussion

All the patients were female, with ages ranging from 51 to 91 years old, with a median age of 64 years. These residents exhibited a significant mental disability as well as a variety of comorbidities. Diabetes, hypertension, epilepsy, and being bedridden are examples of comorbidities. furthermore, we reevaluated the visitor's register to detect regular visits to the residents or symptomatic individuals and found none in the two weeks before to the beginning of symptoms. In addition, we examined the COVID-19, influenza, and varicella vaccination status of every resident and employee and determined that everyone was fully immunized.

Adenovirus, norovirus, and *Bacillus cereus* were likely responsible for the acute gastroenteritis outbreak that affected 27,1% of a center's residents. A systematic review of 1,332 outbreaks (affecting 1,122 residents and 385 staff members) in 1,182 facilities revealed the attack rate of acute gastroenteritis caused by *Clostridium difficile* (51.97 %) and viral gastroenteritis caused by norovirus and rotavirus (48.6 %) [12]. The most often reported transmission pathway was person-to-person [12]. In spite of the fact that bacterial AGE is one of the most common causes of gastroenteritis outbreaks, both foodborne and nonfoodborne bacterial breakouts are often missed by public health experts [12]. This may be due to their short duration and mild symptoms, or because individuals are hesitant to transfer samples to expert labs for testing [13]. In addition, since norovirus infections typically produce gastroenteritis outbreaks in long-term care,

moderate incidence of toxin-mediated diarrhea may be incorrectly attributed to a viral origin. Adenovirus and norovirus present with evident person-to-person transmission and a larger proportion of residents experiencing vomiting and sickness [14]. Proper microbiological confirmation of outbreak etiology in LTCFs is important, and this investigation's limitation could have helped determine whether the outbreak was foodborne.

Between January 24 and 30, seven days accounted for 78.9 % of the illnesses, and the outbreak lasted about 11 days. In terms of outbreak transmission, the epidemic curve with a slight beginnings and slow spread until the third day would support the hypothesis of rotavirus introduction from outside via the index case. However, a dramatic peak lasting two days took place on January 26 and 27, affecting only residents. Given the pathogenesis of norovirus, its epidemiological features, and the fact that calicivirus outbreaks have been linked to a common water source, [15] it is unlikely that this peak was due to consumption of tap water from the center as the residents were drinking from bottle water. The epidemic curve revealed a concentrated start period, which clearly suggested that the outbreak followed a pattern of continuous exposure rather than person-to-person transmission.

The outbreak stopped, however, with the adoption of measures including the closure of the kitchen, the isolation of ill patients, and the complete sterilization of the kitchen and the building. The first was infection brought in from outside, most likely by the index case we identified, which spread through person-to-person transmission, surface contamination, and toilet sharing. Moreover, a significant incidence of gastroenteritis among residents was related to residing on the first floor or in unit 3 (RR 3.7, 95% CI 1.18-11.69, and RR 3.3, 95% CI 1.58-7.02, respectively).

Residents continued to suffer from gastroenteritis for up to 11 days, which may have been caused by the direct contact and contaminated toilet. Bacterial or viral transmission through person-to-person contact, contaminated surfaces, and fomites are additional possibilities, particularly given the

facility's high prevalence of bedridden and comorbidities.

Viruses may also be detected asymptotically; hence, incorrect handling by asymptomatic food handlers and caregivers may also result in outbreaks. It was mostly suggested that rotavirus was at the top of the differential diagnosis of the center outbreak. *Bacillus cereus* and *C. perfringens*, which are thought to be opportunistic bacteriums that produce gastrointestinal symptoms similar to the above-mentioned viruses, may also be the outbreak source.

## 5. Conclusion

The source of infection was not identified as no sample had taken from patients or the prepared food on same day. While it cannot be proven with certainty, this investigation suggests that the outbreak may have originated from food, highlighting the importance of implementing food safety protocols in institutional care facilities. Even though AGE illness may not be severe, it's crucial that public health agencies investigate these outbreaks to uncover any problems with food handling or other possible causes like inadequate infection control or cleaning procedures. If left unaddressed, these issues could lead to serious consequences for elderly residents who are vulnerable. LTCFs, with their population of vulnerable residents, are at a particular risk of viral and bacterial gastroenteritis outbreaks. The source of infection was not identified as no sample had taken from patients or the prepared food on same day. Based on this public health investigation, the process of delivering the food to residents was inappropriate and may led to contamination. We conclude that the possible etiological agent may be the viral gastroenteritis Rotavirus or the bacterial *C. perfringens*.

## 6. Recommendations

Based on the outbreak's observation, the following recommendations are made. Even if the etiology of the illness is unclear, early implementation of preventative measures such as case isolation, health education, cleaning and sanitizing of housing and eating areas, recognition, and withdrawal of symptomatic food handlers is necessary to prevent the spread of the outbreak. Second, epidemiological investigations must be conducted in an efficient way, particularly in an epidemic caused by norovirus, where transmission of the virus is various and detection of the virus in contaminated food is very challenging due to the low titer of the virus. Therefore, it is even more vital to conduct epidemiological research in order to clarify influencing factors. In attempt to effectively identify pathogens responsible for outbreaks, samples must still be submitted simultaneously for pathogen identification and targeted control actions.

## 7. Limitations

The main limitation was a lack of capacity to conduct

necessary laboratory testing for most pathogens. In addition, residents could not communicate due to their disabilities. Lacking detailed information food given limits epidemiologic investigation to identifying pathogens.

## List of Abbreviations

FETP	Field Epidemiology Training Program
SFDA	Saudi Food & Drug Authority
LTCFs	Long term care facilities
AGE	Acute Gastroenteritis

## References

- [1] POP SEM2021A. pdf [Internet]. [cited 2023 Feb 7]. Available from: <https://www.stats.gov.sa/sites/default/files/POP%20SEM2021A.pdf>
- [2] azalghamdi01. Elderly Survey [Internet]. General Authority for Statistics. 2018 [cited 2023 Feb 7]. Available from: <https://www.stats.gov.sa/ar/909>
- [3] 1Statistical-Yearbook-2021.pdf [Internet]. [cited 2023 Feb 7]. Available from: <https://www.moh.gov.sa/Ministry/Statistics/book/Documents/1Statistical-Yearbook-2021.pdf>
- [4] azalghamdi01. Chapter 08 | Service & Social Development [Internet]. General Authority for Statistics. 2019 [cited 2023 Feb 7]. Available from: <https://www.stats.gov.sa/en/1014>
- [5] Clarkson P, Hays R, Tucker S, Paddock K, Challis D. Healthcare support to older residents of care homes: a systematic review of specialist services. *Qual Ageing Older Adults*. 2018 Mar 12; 19 (1): 54–84.
- [6] El Chakhtoura NG, Bonomo RA, Jump RLP. Influence of Aging and Environment on Presentation of Infection in Older Adults. *Infect Dis Clin North Am*. 2017 Dec; 31 (4): 593–608.
- [7] Garg S, Kim L, Whitaker M, O'Halloran A, Cummings C, Holstein R, et al. Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019 — COVID-NET, 14 States, March 1–30, 2020. *MMWR Morb Mortal Wkly Rep*. 2020 Apr 17; 69 (15): 458–64.
- [8] Greig JD, Lee MB. Enteric outbreaks in long-term care facilities and recommendations for prevention: a review. *Epidemiol Infect*. 2009 Feb; 137 (2): 145–55.
- [9] Hasanpour AH, Sepidarkish M, Mollalo A, Ardekani A, Almkhtar M, Mechaal A, et al. The global prevalence of methicillin-resistant *Staphylococcus aureus* colonization in residents of elderly care centers: a systematic review and meta-analysis. *Antimicrob Resist Infect Control*. 2023 Jan 29; 12 (1): 4.
- [10] Norovirus | CDC [Internet]. [cited 2023 May 9]. Available from: <https://www.cdc.gov/norovirus>
- [11] Karakusevic A, Devaney P, Enstone A, Kanibir N, Hartwig S, Carias CDS. The burden of rotavirus-associated acute gastroenteritis in the elderly: assessment of the epidemiology in the context of universal childhood vaccination programs. *Expert Rev Vaccines*. 2022 Jul 3; 21 (7): 929–40.

- [12] Lee MH, Lee GA, Lee SH, Park YH. A systematic review on the causes of the transmission and control measures of outbreaks in long-term care facilities: Back to basics of infection control. *PloS One*. 2020; 15 (3): e0229911.
- [13] Chen D, Li Y, Lv J, Liu X, Gao P, Zhen G, et al. A foodborne outbreak of gastroenteritis caused by Norovirus and *Bacillus cereus* at a university in the Shunyi District of Beijing, China 2018: a retrospective cohort study. *BMC Infect Dis*. 2019 Oct 29; 19 (1): 910.
- [14] Ai J, Zhu Y, Fu J, Cheng X, Zhang X, Ji H, et al. Study of Risk Factors for Total Attack Rate and Transmission Dynamics of Norovirus Outbreaks, Jiangsu Province, China, From 2012 to 2018. *Front Med*. 2021; 8: 786096.
- [15] Brugha R, Vipond IB, Evans MR, Sandifer QD, Roberts RJ, Salmon RL, et al. A community outbreak of food-borne small round-structured virus gastroenteritis caused by a contaminated water supply. *Epidemiol Infect*. 1999 Feb; 122 (1): 145–54.