



# Knowledge, Attitude And Practices About Measles, Measles Vaccine And Its Risk Factors Among Medical Students Of Jalal-Abad State University, Kyrgyzstan

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## Abstract:-

**Introduction:** - This study investigates the knowledge, attitudes, and practices (KAP) regarding measles vaccination and associated risk factors among medical students at Jalal-Abad State University (JASU), Kyrgyzstan. Measles, a highly contagious viral disease, remains a significant global health challenge, with recent resurgences linked to declining vaccination rates and misinformation.

**Objective:** - The objective was to assess student understanding and identify gaps in vaccination practices to inform public health strategies.

**Methodology:** - A cross-sectional analytical study was conducted using an online survey distributed to medical students across all academic years. Data from 206 respondents were analyzed using SPSS software version 29.0, with statistical significance set at  $p < 0.05$ . Key demographic data and responses were summarized to evaluate KAP dimensions.

**Result:** - Results showed that while 89.3% of students recognized measles as a viral and airborne disease, vaccination rates were suboptimal at 53.9%. Key risk factors identified included incomplete vaccination (70.6%), international travel (72.8%), and environmental conditions like low humidity (43.7%). While most participants

(79.6%) acknowledged the importance of vaccination, misconceptions about antibiotics (41.5%) and uncertainty regarding vaccination schedules persisted.

**Conclusion:** - The study concludes that targeted educational initiatives, catch-up vaccination programs, and advocacy for vaccine adherence are critical to mitigating measles outbreaks among student populations. These findings underscore the need for integrating public health strategies into medical curricula to bridge gaps between knowledge and practice.

### **Introduction:-**

Measles is a highly contagious, serious disease caused by a virus from the *paramyxovirus* family, and it typically spreads through direct contact and respiratory droplets from an infected person. Measles primarily affects the respiratory tract but can spread throughout the body, causing a systemic infection [1]. In the United States, measles is fatal for about 2 in 1,000 children infected. Between 2000 and 2018, measles vaccinations prevented an estimated 23.2 million deaths worldwide [2]. Measles is as a result of a measles virus that is a spherical, non segmented, single-stranded RNA virus belonging to the *Morbillivirus* family, it's far intently associated with the rinderpest and dog distemper viruses [3]. While it can manifest in various forms, the two most common types are Rubeola (Classic Measles) and Rubella (German Measles). Both forms are preventable through widespread vaccination with the MMR (Measles, Mumps, and Rubella) vaccine.

1. Rubeola (Classic Measles):- Rubeola, commonly referred to as classic measles, is the most prevalent form of the disease. It is caused by the measles virus, which spreads via respiratory droplets and is known for its high transmission rate. The incubation period for rubeola typically ranges from 7 to 14 days. The clinical presentation begins with prodromal symptoms, including high fever, cough, coryza (runny nose), and conjunctivitis (red eyes). This is followed by the appearance of Koplik's spots, which are small, white lesions inside the mouth and serve as a pathognomonic sign of measles. The characteristic measles rash begins on the face and gradually spreads to the rest of the body, including the trunk and extremities. The rash progresses from red, flat macules to raised papules, and typically fades in the same order in which it appeared [4].

2. Rubella (German Measles):- Rubella, also known as German measles, is caused by the Rubella virus, which belongs to the *Togaviridae* family. Although rubella shares some similarities with rubeola, particularly the rash and mild fever, it is generally a much milder illness. The rubella rash typically appears first on the face before spreading to the trunk and limbs, and it resolves within three days. Other common symptoms include swollen lymph nodes, particularly behind the ears and at the back of the neck. While rubella is usually self-limiting and does not cause severe illness in children or adults, it poses a significant risk during pregnancy. If a pregnant woman contracts rubella during the first trimester, the virus can cross the placenta and cause Congenital Rubella Syndrome (CRS), leading to serious birth defects, including heart abnormalities, cataracts, deafness, and intellectual disabilities. For this reason, rubella vaccination is critical in preventing CRS [5].

Measles is a highly contagious viral illness that presents with a range of signs and symptoms that evolve in stages. The initial phase, known as the prodromal phase, typically begins 10 to 12 days after exposure to the virus and is characterized by high fever, often exceeding 39°C, along with cough, coryza (runny nose), and conjunctivitis (red, watery eyes). One of the key diagnostic features during this phase is the appearance of Koplik's spots—small, white spots with bluish centers that appear inside the mouth, particularly on the inner cheeks. These spots usually emerge 1 to 2 days before the onset of the rash. The characteristic maculopapular rash typically appears 3 to 5 days after the prodromal symptoms begin. It starts on the face, especially around the hairline, and spreads downwards to the neck, trunk, arms, legs, and feet. The rash is initially red and flat, but as it progresses, raised spots (papules) may develop. It usually lasts for 5 to 6 days before fading in the same order in which it appeared. During the rash phase, fever often peaks, sometimes reaching 40°C (104°F), and the patient may experience increased discomfort. As the rash subsides, the patient enters the recovery phase, during which the fever decreases, and the rash fades, often leaving behind areas of discoloration or mild skin peeling. Respiratory symptoms, such as cough, may persist for one to two weeks following the resolution of the rash. In

some cases, measles can lead to severe complications, including pneumonia, otitis media, diarrhea, and encephalitis, particularly in young children, malnourished individuals, and those with weakened immune systems [6].

### **Risk factors of Measles:-**

Measles, a highly contagious viral disease which presents a significant public health concern, particularly in regions with low vaccination coverage. Several risk factors contribute to the re-emergence of measles, even in areas where it was previously under control. A primary risk factor is inadequate immunization coverage, often due to vaccine hesitancy, misinformation, and lack of awareness about the importance of the measles vaccine. In certain populations, socio-economic barriers, such as limited access to healthcare and vaccines, exacerbate the problem. Additionally, global travel and migration can facilitate the spread of the virus from regions experiencing outbreaks to areas with susceptible populations. Environmental factors, such as crowded living conditions, also heighten transmission risks, especially in densely populated urban areas or institutions like universities. Among student populations, such as those at JASU, insufficient vaccination rates, coupled with a lack of awareness about the seriousness of the disease and the benefits of vaccination, may contribute to the re-emergence of measles. Addressing these risk factors through education, improved vaccination programs, and targeted public health interventions is critical to controlling the spread of measles.

According to a new report from the World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (CDC), Globally measles cases have seen a significant rise in recent years. By the end of 2022, measles cases had more than doubled compared to the previous year, with over 9 million reported cases and 128,000 deaths worldwide. This surge is largely attributed to the decline in vaccination coverage during the COVID-19 pandemic. Approximately 33 million children missed a measles vaccine dose in 2022, putting many at increased risk, particularly in low-income countries, which have the lowest immunization rates. Global vaccine coverage remains below the 95% target necessary to prevent outbreaks [7].

According to Global center for health security that in Kyrgyzstan, there has been a significant rise in measles cases in recent years. In 2023, the country reported 559 cases by June, a stark increase from just 23 cases in 2022. This surge followed a decline in cases, with only about 3 cases in 2021. However, prior to the pandemic, Kyrgyzstan saw 733 cases in 2020 and 2,380 cases in 2019. The Osh region was most affected in 2023, with 386 of the reported cases. Authorities have since launched a vaccination campaign to prevent further outbreaks [8].

### **Method and methodology :-**

A descriptive cross-sectional analytical design to assess the knowledge, attitudes, and practices (KAP) regarding the measles, measles vaccine and its risk factors among medical students at JASU, Kyrgyzstan. The study was conducted using an online survey, distributed through Google Forms. The Google Form was distributed electronically through student email lists, social media platforms, and academic groups within JASU. Data collection occurred over a two-week period [15/October/2024 - 29/October/2024], with reminders sent after one week to increase the response rate. The target population for this study consisted of 1st to 6th year medical students of JASU. Data was exported from Google Forms into statistical software SPSS software version 29.0 for analysis. Descriptive statistics (means, frequencies, percentages) were used to summarize the demographic characteristics and responses to knowledge, attitude, and practice questions. A p-value of <0.05 was considered statistically significant. The study met the inclusion and exclusion Criteria.

The Inclusion Criteria were:-

1. Participants must be currently enrolled in the medical faculty at Jalal-Abad State University (JASU), Kyrgyzstan, across any academic year (first to final year).
2. Participants aged 18 years and above, as they are legally adults and capable of providing informed consent.
3. Both vaccinated and unvaccinated students will be included to compare knowledge, attitudes, and practices between different groups.

The Exclusion Criteria were:-

1. Students from other faculties or departments at JASU who are not part of the medical program will be excluded.
2. Exclusion of students under 18 years of age, as they may not be considered mature enough to provide informed consent on healthcare-related topics in many research ethics frameworks.
3. Participants who have never received or been exposed to formal education regarding vaccines, specifically the measles vaccine.
4. Students who are not currently active in their studies, such as those on academic leave or deferred enrollment, will be excluded from the study.

**Result:-**

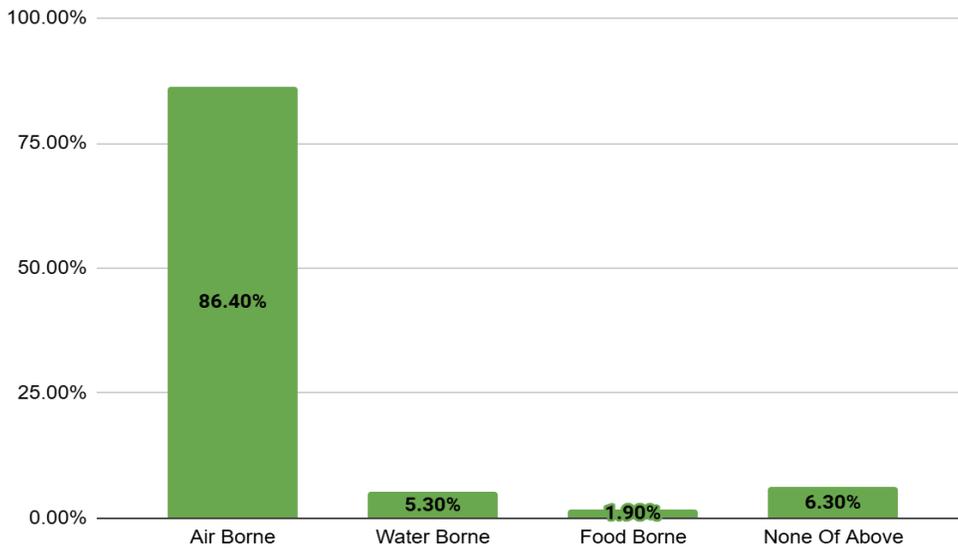
**Demographic Characteristics:-**

The total number of students who participated in this study were 206. Among the 206 students n= 113 were (54.9%) Males, 92 (44.7%) were females & n= 1 (0.5%) were other. In this study, n= 27 (13.1%) were with an age group of 17 to 19, n = 80 (38.8% ) were with the age group of 20 to 22, n=48 (23.3%) were with an age group of 23 to 25 , n=51 (24.8%) were with an age group of 26 to 28. In this study n= 21 (10.2%) of father were middle school , n= 46 (22.3%) were having high school, n= 80 (38.8%) were having graduate and n= 59 (28.6%) were having postgraduate . In this study, n=44 (21.4%) of mother were high school , n= 51 (24.8%) were having Secondary school, n= 60 (29.1%) were having graduate and n= 51 (24.8%) were having postgraduate. In this study n= 22(10.7%) of father were Medicine and Pharmaceutical Sector, n= 17 (8.3%) of father were Government employees and n= 134 (65%) of the father were Private and Self Employed. In this study n= 139 (67.5%) of the mothers were housewives, n= 14 (6.9%) of mothers were Medicine and Pharmaceutical Sector, n= 28 (13.6%) of mother were Government employees and n= 25 (12.1%) of mother were educational Sector. Shown in **TABLE NO. 1**

Responses	Frequency	Percentage
<b>Gender</b>		
Male	113	54.9
Female	92	44.7
Other	1	0.5
<b>Age</b>		
17-19	27	13.1
20 - 22	80	38.8

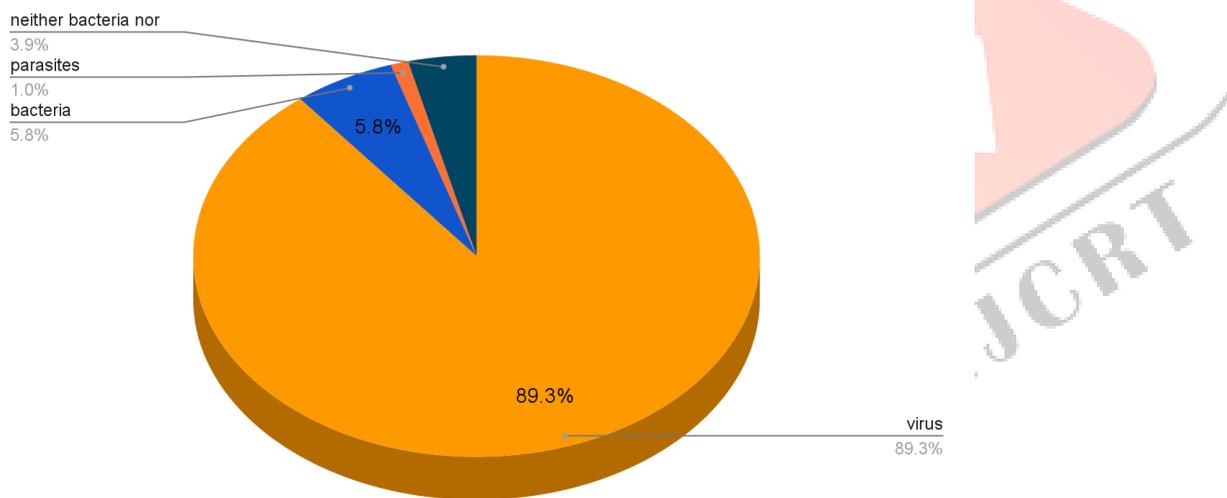
23 - 25	48	23.3
26 - 28	51	24.8
<b>Respondents Father's Education</b>		
Middle School	21	10.2
High School	46	23.3
Graduated	80	38.8
Post-Graduated	59	28.6
<b>Respondents Mother's Education</b>		
High school	44	21.4
Secondary school	51	28.8
Graduated	60	29.1
Post-Graduated	51	24.8
<b>Respondents Father's Occupation</b>		
Medicine & Pharmaceutical Sector	22	10.7
Governments employees	17	8.3
Private & Self employees	134	65
<b>Respondents Mother's Occupation</b>		
House Wife	139	67.5
Medicine & Pharmaceutical Sector	14	6.9
Governments employees	28	13.6
Educational sector	25	12.1

**Estimating the Understanding of the students about Measles:-** According to the distributed questions provided to the students through Google Form format, response from them have been collected accordingly, and it was seen that about 100% of the students have an accurate knowledge about Measles disease. Though few students prefer to not answer to some questions. Around n= 178 (86.4%) responded that the disease is an Air-Borne disease, n= 11 (5.3%) for Water-Borne disease, n=4 (1.9%) for Food-Borne disease and n=13 (6.3%) gave an opinion that none of the mentioned diseases causes Measles. Shown in **FIGURE NO. 1**



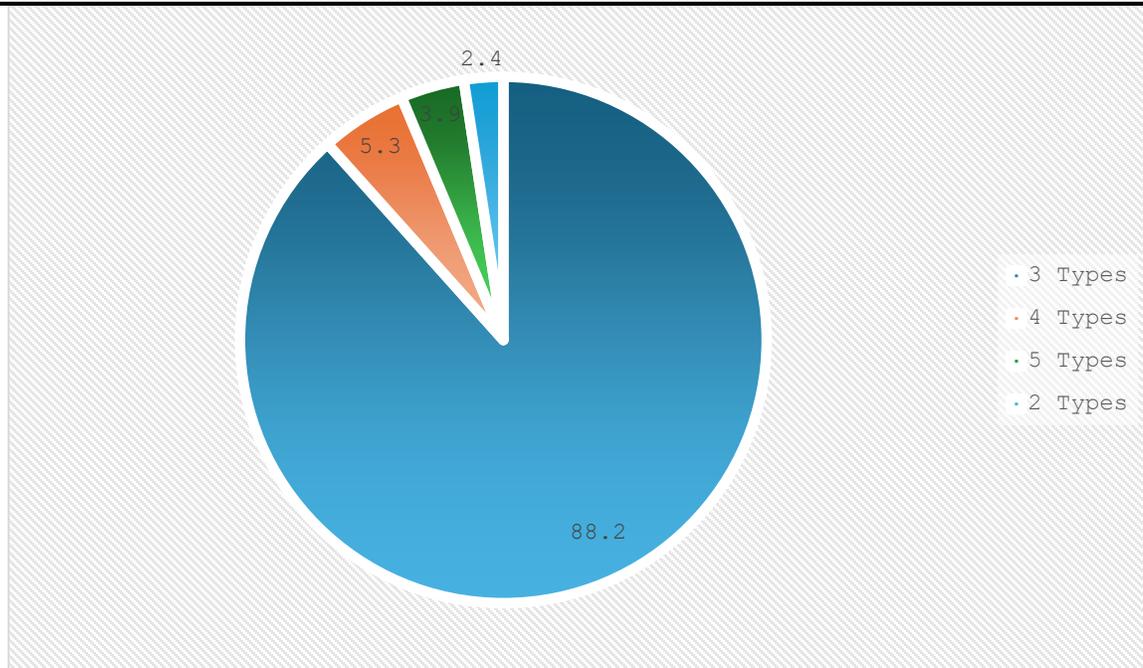
**Figure No. 1: What Type Of Disease Is Measles ?**

Measles is mainly caused by Virus n= 184 (89.3%), while some of them responded that the measles disease is caused by Bacteria n= 12 (5.8%), parasites n= 2 (1%) and n= 8 (3.9%) answered that neither bacteria nor virus caused the disease. Shown in **FIGURE NO. 2**



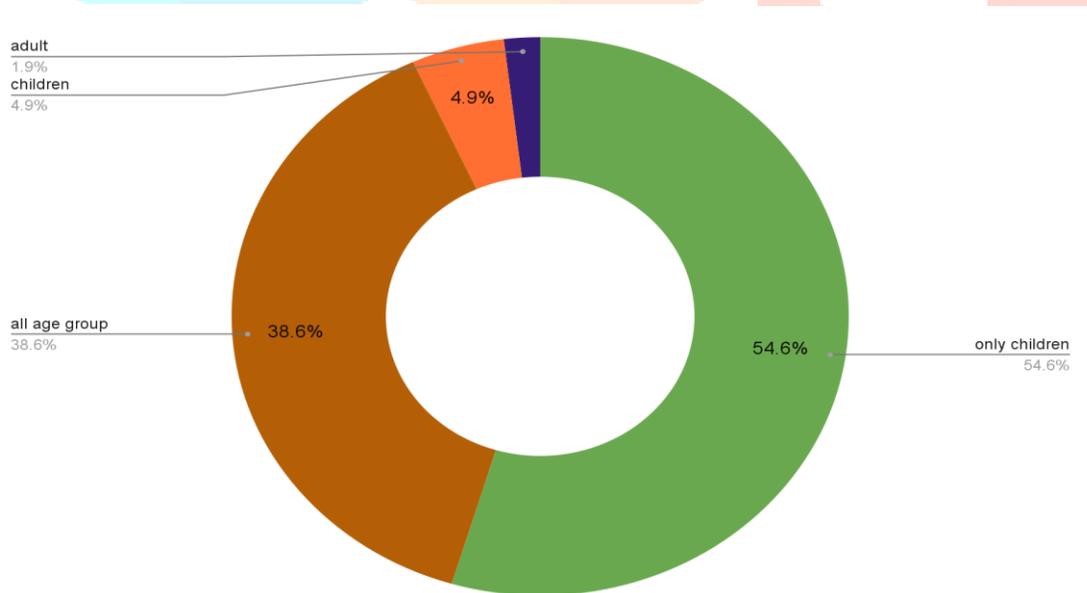
**Figure No. 2: Which Of The Following Caused Measles ?**

As other diseases, Measles also have different types which can infect both the children and adults. With the knowledge that the students have about the measles disease, about n= 182 (88.2%) of them have interpreted that there are 3 types of measles, however, n= 11 (5.3%) of the students have replied that there is 4 types of measles, n=8 (3.9%) and n= 5 (2.4%) have replied that there is 5 types of measles and 2 types of measles respectively. The distribution between the types of Measles is shown in **Figure No. 3**



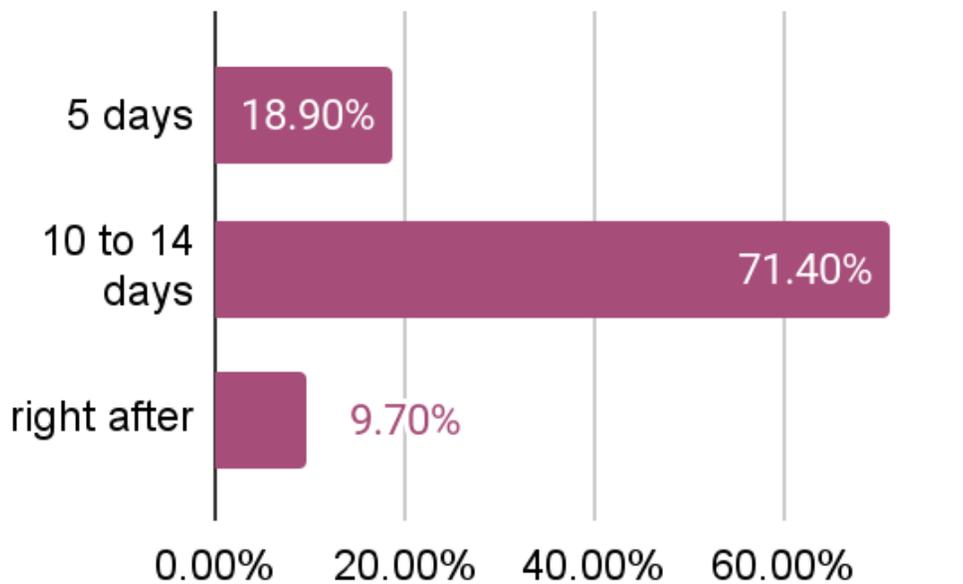
• **Figure No. 3 : How Many Different Types Of Measles ? ?**

The disease can infect both adults and children in many ways. About n=113 (54.9%) of the students responded that it infects only children, and the other n=80 (38.8%), n=10 (4.9%) and n=3 (1.5%) infect all age group, children and adults respectively. Shown in **Figure No. 4**



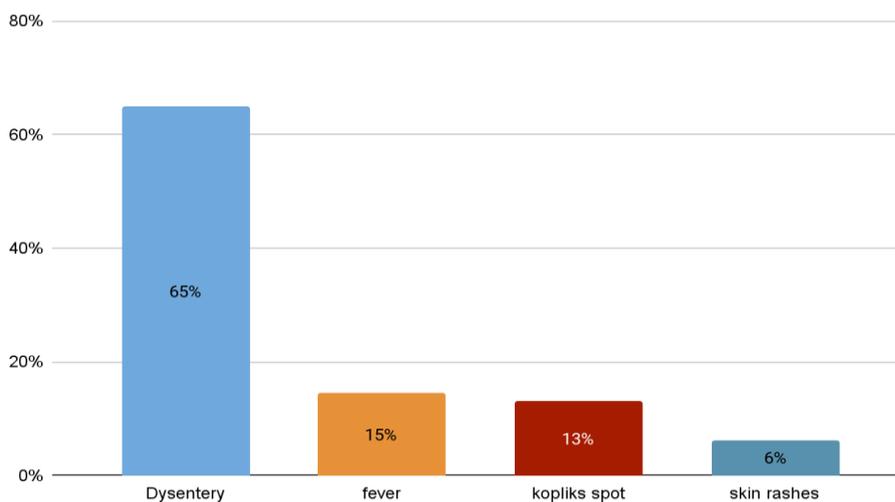
**Figure No. 4 : Does Measles Mainly Infect ?**

Based from their understanding about the disease, n= 39 (18.9%) responded that the symptoms of measles appear within 5 days, n= 147 (71.4%) answered that its symptoms appear within 10-14 days and the other n= 20 (9.7%) replied that the symptoms of the disease appear right after infection. Shown in **Figure No. 5**



**Figure No. 5 : When Does The Signs & Symptoms Of Measles Appear ?**

The research findings indicate that dysentery, observed in  $n=134$  cases (65%), was the most frequently reported symptom that was not associated with measles. In contrast, fever were identified in only  $n=32$  cases (14.5%), while Koplik's spots in  $n=27$  (13.1%) and skin rashes were each observed in  $n=13$  (6.3%). These results support the well-documented characteristic symptoms of measles, which typically include fever, Koplik's spots, and skin rashes, while dysentery is not a recognized symptom of the disease. Shown in **Figure No. 6**



**Figure No. 6 : The Following Are The Symptoms Of Measles , Except ?**

The study identified multiple risk factors contributing to measles susceptibility. Incomplete vaccination was the most significant factor, with  $n=146$  (70.6%) participants recognizing it as a risk, while  $n=21$  (10.2%) denied its association, and  $n=39$  (18.9%) were uncertain. Among vulnerable groups, pregnant women were highlighted as at-risk, with  $n=147$  (71.4%) respondents affirming this,  $n=21$  (10.2%) disagreeing, and  $n=38$  (18.8%) expressing uncertainty. Similarly, international travel was identified as a risk factor by  $n=150$  (72.8%) participants, whereas 22 (10.7%) disagreed, and 34 (16.5%) were unsure.

Regarding specific risk factors, our results show that unvaccinated children  $n=54$  (26.2%) , and vitamin A deficiency  $n=14$  (6.8%) are significant contributors. However, a staggering  $n=127$  (61.7%) of participants

identified both unvaccinated children and vitamin A deficiency as primary risk factors. Only n=11 (5.3%) of respondents reported none of the above as risk factors.

Environmental risk factors were also assessed, revealing that low relative humidity n=90 (43.7%) and cold

Risk factor of measles	FREQUENCY	PERCENTAGE
<b>Incomplete vaccination</b>		
Yes	146	70.6
No	21	10.2
May be	39	18.9
<b>Pregnant women at risk</b>		
Yes	147	71.4
No	21	10.2
May be	38	18.8
<b>International travel can increase risk</b>		
Yes	150	72.8
No	22	10.7
May be	34	16.5
<b>What are the main risk factors of measles ?</b>		
Deficiency	14	6.8
Unvaccinated	54	26.2
Both of the above	127	61.7
None of the above	11	5.3
<b>What is the environmental risk factor of measles?</b>		
Low relative humidity	90	43.7
Cold temperature	87	42.2
Hot temperature	29	14.1

temperature n=87 (42.2%) are perceived as primary contributors to measles transmission. In contrast, hot temperature was identified as a risk factor by only n=29 (14.1%) of participants. Shown in **Table No. 2**

These findings underscore the importance of vaccination, vitamin A supplementation, and environmental factors in preventing measles outbreaks. Specifically, targeting unvaccinated children and addressing vitamin A deficiency can significantly mitigate measles risk. Furthermore, public health strategies should prioritize education on environmental risk factors, particularly during periods of low humidity and cold temperature.

### Estimating the Attitude of the students towards Measles according to their Understanding

The study aimed to assess attitudes and perceptions about measles among participants, revealing a range of insights. Among respondents, only n=23 (11.2%) reported having suffered from measles, while the majority, n=183 (88.8%), had not. Of those who had suffered from measles, n=20 (10.2%) reported experiencing re-emerging measles.

Regarding vaccination, n=111 (53.9%) reported being vaccinated against measles, while n=95 (46.1%) had not. When asked whether measles and chickenpox were the same, n=165 (80.1%) correctly identified that they were not, though n=15 (7.3%) believed they were, and n=26 (12.6%) were unsure. Shown in **Table No. 3**

Responses related to know the attitude about measles	FREQUENCY	PERCENTAGE
<b>Have you ever suffered from measles?</b>		
Yes	23	11.2
No	183	88.8
<b>Have you ever suffered from re-emerging measles?</b>		
Yes	20	10.2
No	177	89.8
<b>Have you had measles vaccination?</b>		
Yes	111	53.9
No	95	46.1

In terms of personal hygiene during illness, n=107 (51.9%) of respondents indicated they would bathe if they had measles, while n=42 (20.4%) would avoid bathing, and n=57 (27.7%) were uncertain. The role of traditional herbs in alleviating symptoms was less clear, with n=93 (45.1%) believing herbs might help, n=79 (38.3%) agreeing they do, and n=34 (16.5%) disagreeing.

When exploring symptoms, n=163 (79.1%) recognized that measles causes rashes and itching, and n=145 (70.4%) acknowledged that scratching these rashes could leave scars. However, n=28 (13.6%) were unsure about these effects, and a minority denied them n=15 (7.3%) for rashes, n=17 (8.3%) for scars.

Most respondents n=164 (79.6%), agreed that vaccination helps control measles, with only n=14 (6.8%) denying its efficacy and n=28 (13.6%) uncertain. A similarly high proportion, n=163 (79.1%), expressed a willingness to encourage relatives and friends to vaccinate their children, while n=15 (7.3%) were against this, and n=28 (13.6%) were unsure.

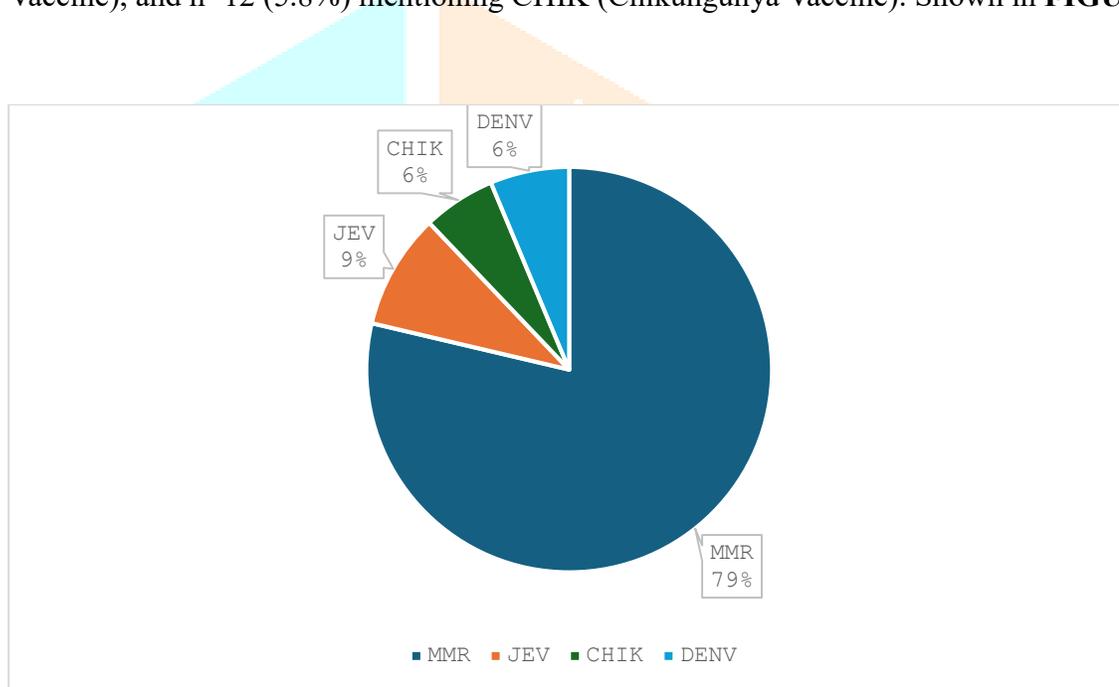
Finally, social attitudes towards visitors during illness showed that n= 147 (71.4%) would not allow visitors if they had measles, while n=23 (11.2%) would permit them, and n=36 (17.5%) were undecided. Shown in **Table No. 4**

Responses	Frequency	Percentage
<b>Are measles and chicken pox the same</b>		
Yes	15	7.3
No	165	80.1
May be	26	12.6
<b>Would you bath if you had measles ?</b>		
Yes	107	51.9
No	42	20.4
May be	57	27.7
<b>Traditional herbs help to reduce symptoms?</b>		
Yes	79	38.3
No	34	16.5
May be	93	45.1
<b>Does measles cause skin rashes and itching?</b>		
Yes	163	79.1
No	15	7.3
May be	28	13.6
<b>Does scratching the itchy rash leave scars on the skin?</b>		
Yes	145	70.4
No	17	8.3
May be	44	21.4
<b>Can vaccination help control measles?</b>		
Yes	164	79.6
No	14	6.8
May be	28	13.6
<b>Can relatives and friends be encouraged to have their children vaccinated against measles?</b>		
Yes	163	79.1

No	15	7.3
May be	28	13.6
<b>Can visitors be allowed if you have measles?</b>		
Yes	23	11.2
No	147	71.4
May be	36	17.5

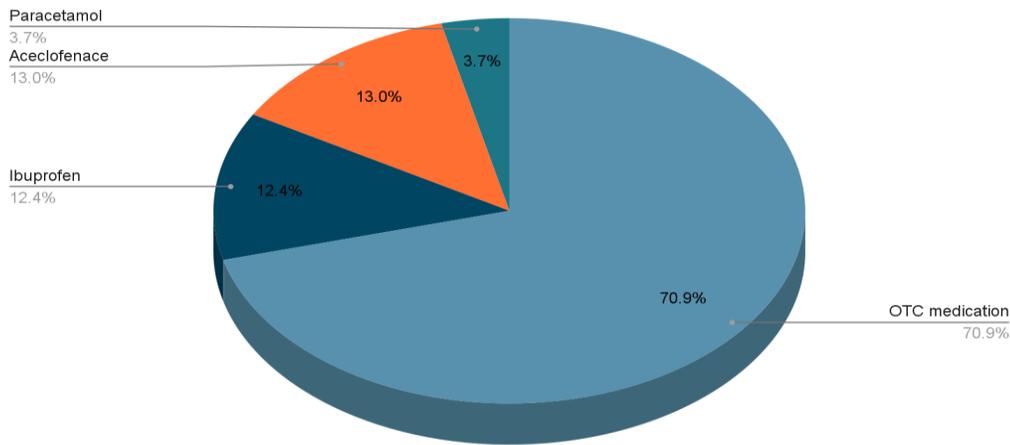
### Estimating the Practice done toward Measles with respect to the knowledge Of the students

The study aimed to assess practices regarding measles among respondents, shedding light on their knowledge and actions to manage or prevent the disease. Most respondents n=162 (78.6%), correctly identified the MMR (measles, mumps, and rubella) vaccine as the one given to measles patients, though there was some confusion, with n=19 (9.2%) mentioning JEV (Japanese Encephalitis Virus), n=13 (6.3%) mentioning DENV (Dengue Vaccine), and n=12 (5.8%) mentioning CHIK (Chikungunya Vaccine). Shown in **FIGURE NO. 7**



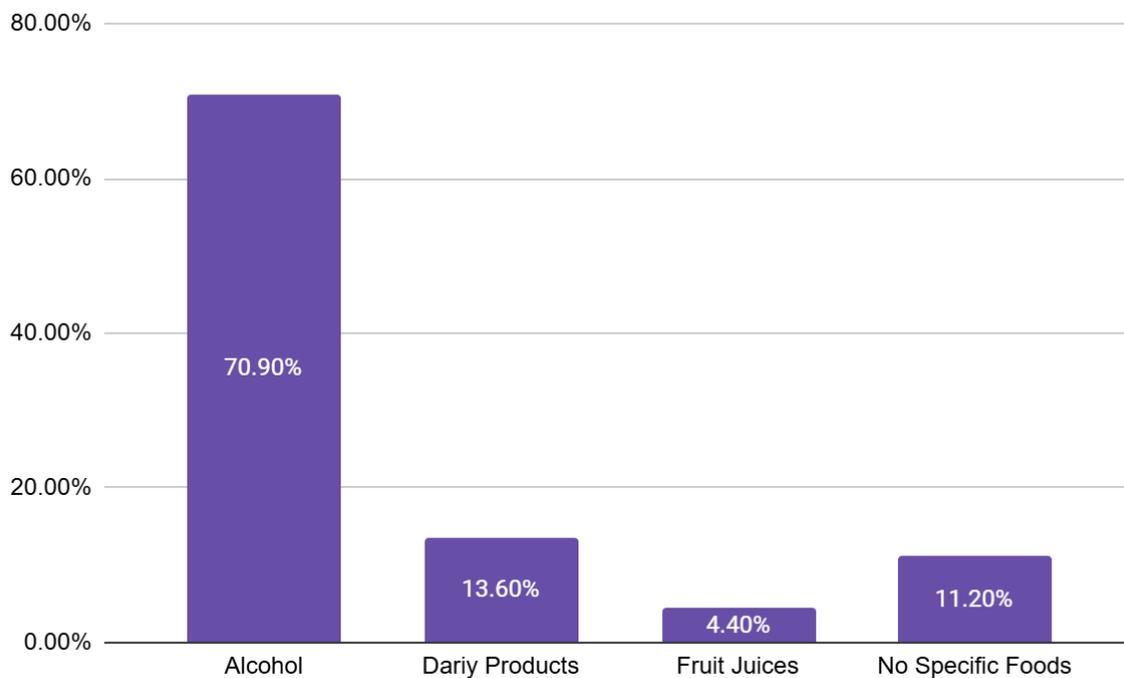
**Figure No. 7 : What Vaccine Is Giving To Measles Patients ?**

Regarding over-the-counter (OTC) medication to manage fever during measles, the majority, n=142 (68.9%), reported using a combination of ibuprofen and paracetamol. Smaller groups favored ibuprofen n= 25 (12.1%), aceclofenac n=26 (12.6%), or paracetamol alone n=13 (3.6%). Shown in **Figure No. 8**



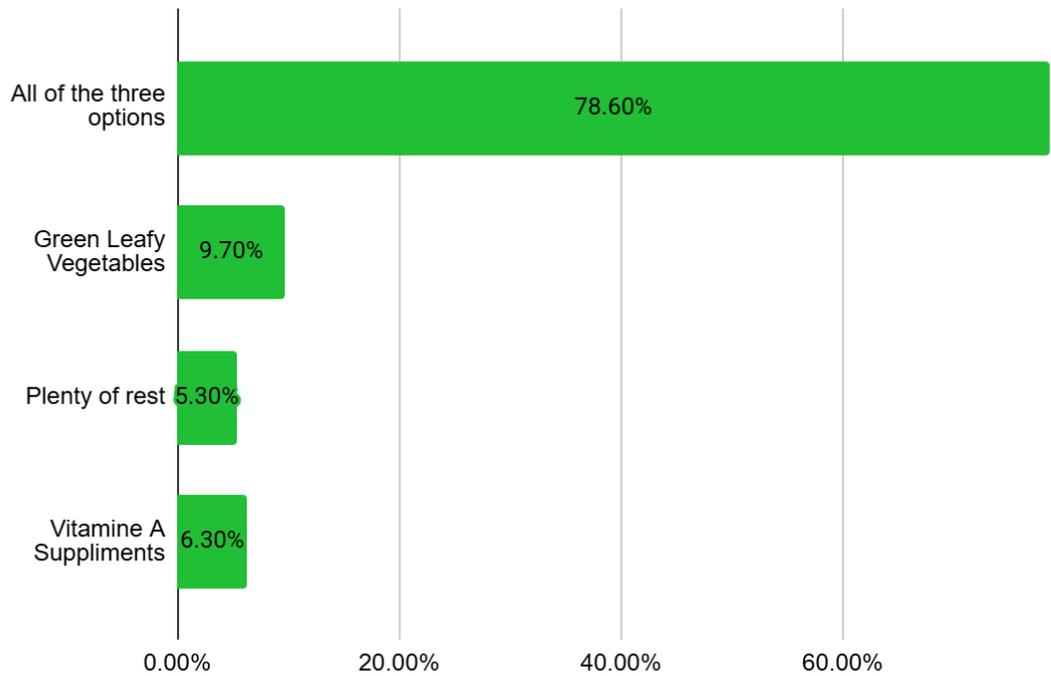
**Figure No. 8 : What Type Of OTC Medication Is Given To Reduce Fever In Measles Disease ?**

When asked about foods to avoid during measles, n=146 (70.9%) identified alcohol as the primary item to be avoided, followed by dairy products n=28 (13.6%), and fruit juices n=9 (4.4%). Meanwhile, n= 23 (11.2%) believed no specific foods needed to be avoided. Shown in **Figure No. 9**



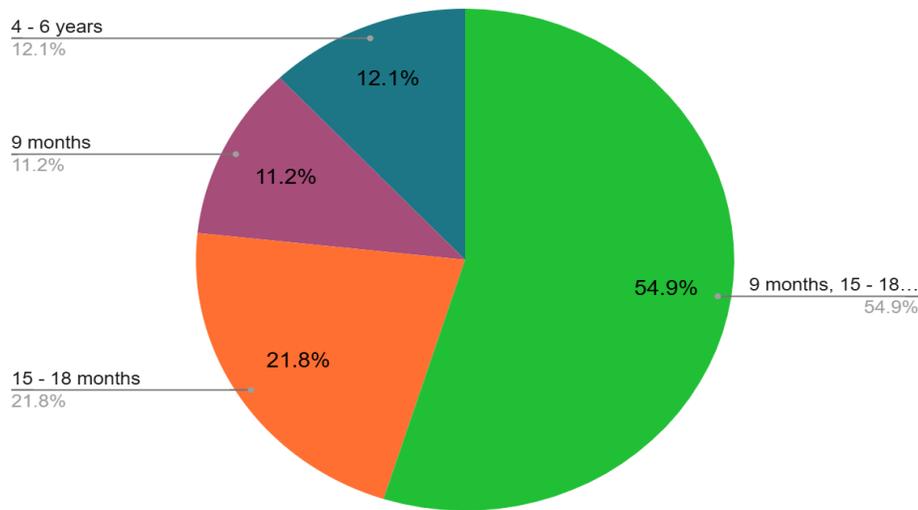
**Figure No. 9 : What Type Of Food Should Be Avoided During Measles ?**

To boost immunity at home, the majority n= 162 (78.6%), endorsed a combination of practices, including consuming green leafy vegetables, taking plenty of rest, and using Vitamin A supplements. Only smaller fractions prioritized these measures individually: n=20 (9.7%) for vegetables, n=11 (5.3%) for rest, and n=13 (6.3%) for Vitamin A. Shown in **Figure No. 10**



**Figure No. 10 : How Can A Person Boost Their Immune System At Home ?**

On the recommended age for measles vaccination, n=113 (54.9%) correctly acknowledged that vaccination is advised at all the recommended ages (9 months, 15-18 months, and 4-6 years). Smaller groups mentioned individual age brackets: n=45 (21.8%) for 15-18 months, n=23 (11.2%) for 9 months, and n=25 (12.1%) for 4-6 years. Shown in **Figure No 11**



**Figure No. 11 : What Is The Recommended Age For Measles Vaccination ?**

A notable proportion, n=85 (41.5%), believed that antibiotic drugs could help treat the symptoms of measles, while n=79 (38.3%) correctly disagreed, and n=42 (20.4%) strongly rejected the idea.

Awareness of vaccination programs for measles prevention was relatively high, with n=153 (74.3%) reporting awareness. However, n=28 (13.6%) were unaware, and n=25 (12.1%) were entirely unfamiliar with such programs.

Finally, n= 145 (70.4%) agreed that vaccination increases immunity against measles. However, n=34 (16.5%) disagreed, and smaller groups expressed uncertainty, with n=13 (6.3%) saying "maybe" and n=14 (6.8%) indicating they "don't know." Shown in **Table No. 5**

Responses	Frequency	Percentage
<b>Can Antibiotic Drugs help to treat the symptoms of measles?</b>		
Yes	85	41.5
No	73	38.3
Not At All	42	20.4
<b>Are you aware about vaccination programs for prevention of measles ?</b>		
Yes	153	74.3
No	28	13.6
Not At All	25	12.1
<b>Does getting vaccinated increases the immunity of a person?</b>		
Yes	145	70.4
No	34	16.5
May Be	13	6.3
Don't Know	14	6.8

### Discussion:-

#### Discussion of Socio Demographic:-

This study analyzed the gender distribution of 206 medical students at JASU, Kyrgyzstan, revealing a slight male predominance with 113 male participants (54.9%), 92 female participants (44.7%), and one individual identifying as "other" (0.5%). Among the total participants, 23 students reported a history of measles infection, with males comprising the majority (n=17) compared to females (n=6). These findings reflect gender-related differences in measles exposure, which may be influenced by various biological, behavioral, and sociocultural factors. The higher prevalence of measles infection among male participants aligns with observations from

similar studies. Similar research is Manfred S. Green (2022) in BMC Infectious Disease[9]. Identified males as more susceptible to infectious diseases, including measles, due to increased exposure to outdoor environments and less consistent health-seeking behaviors. Another research done by Qiongying Yang (2014) in Guangzhou, Southern China [10] highlighted that males were less likely to participate in routine vaccination programs during childhood, potentially increasing their vulnerability to vaccine-preventable diseases later in life. Female participants in this study had lower reported cases of measles (n=6), which might indicate better vaccination compliance or increased likelihood of seeking healthcare services. Sonja Merten (2015) in Canada by PLOS [11] found similar trends in Bangladesh, where females exhibited a higher tendency to follow preventive health measures, including vaccination. However, the gender disparity in health outcomes also raises concerns about underreporting or differences in exposure levels between genders, emphasizing the need for further investigation. These findings suggest the necessity of targeted health education campaigns addressing gender-specific barriers to vaccination and disease prevention. For males, interventions might focus on improving awareness of vaccination schedules and reinforcing the importance of routine health check-ups. For females, maintaining high vaccination compliance while addressing potential barriers such as cultural norms or limited access to healthcare remains critical.

This study assessed the age distribution of 206 medical students at JASU, Kyrgyzstan, categorized into four groups: 17–19 years (n=27, 13.1%), 20–22 years (n=80, 38.8%), 23–25 years (n=48, 23.3%), and 26–28 years (n=51, 24.8%). Among these, 23 students reported a history of measles infection, with the highest number of cases observed in the 20–22 age group (n=10), followed by the 23–25 age group (n=8), the 26–28 age group (n=3), and the 17–19 age group (n=2). These findings suggest a higher burden of measles among students in their early 20s, which may reflect increased vulnerability due to gaps in vaccination coverage during their childhood. The higher prevalence of measles among the 20–22 and 23–25 age groups aligns with similar research in global trends reported by Gill Norman (2024) by BMC Public Health [12], who highlighted a resurgence of measles among young adults due to incomplete vaccination during childhood and waning immunity. This trend may also be linked to disruptions in routine immunization programs caused by sociopolitical instability or public health crises, such as the COVID-19 pandemic. Similar observations were seen in a study by Samiuddin Tari (2022) in Pakistan [13], where young adults were disproportionately affected by measles outbreaks due to inadequate vaccination coverage during earlier years. Interestingly, the youngest group (17–19 years) reported the fewest cases (n=2), which may indicate the positive impact of improved vaccination campaigns targeting younger cohorts. For instance, WHO (2023) [14] reported significant progress in measles control among children and adolescents in regions with intensified immunization efforts. However, the presence of cases even in this group highlights the need for continued vigilance and efforts to close existing gaps in vaccination coverage. The relatively low number of cases among the oldest group (26–28 years, n=3) may reflect lower exposure to measles outbreaks in this cohort or better immunity due to previous infection or vaccination. These findings underscore the importance of age-specific strategies to address measles susceptibility. For the 20–22 and 23–25 age groups, targeted catch-up vaccination campaigns and awareness programs are crucial to mitigating the risk of future outbreaks. For younger students (17–19 years), ensuring high vaccination rates through routine immunization programs remains a priority. Furthermore, public health policies should consider integrating booster doses for older age groups (26–28 years) to maintain long-term immunity.

### **Discussion of Knowledge:-**

The results demonstrated that the majority of participants possessed accurate knowledge about measles as a viral, airborne disease, with 89.3% correctly identifying the measles virus as the causative agent. This is in line with findings from a study conducted by Jasmine L. Khongthaw (2022) [15] among Indian pharmacy students, where a similar level of knowledge was observed regarding the etiology and transmission of measles. Additionally,

88.2% of students recognized the types of measles, reflecting a sound understanding of the disease's clinical presentation.

Despite their knowledge, the vaccination rate among JASU students was 53.9%, which falls short of the 95% coverage needed to achieve herd immunity, as emphasized by the World Health Organization (WHO). A recent report by WHO and CDC (2023) [16] highlighted a global decline in vaccination rates during the COVID-19 pandemic, which may explain the low uptake observed in this study. Similar vaccination gaps have been documented in Kyrgyzstan, where measles cases surged from 23 in 2022 to 559 in 2023, emphasizing the urgent need for targeted interventions.

### **Discussion of Attitude :-**

Attitudes toward measles vaccination were largely positive, with 79.6% of respondents agreeing that vaccination helps control the disease. Furthermore, 79.1% expressed willingness to encourage others to vaccinate their children. These findings align with a study by Syed M. Akramuzzaman (2002) in Dhaka Bangladesh [17], which also reported a high level of pro-vaccine attitudes among medical students. However, vaccine hesitancy persists among a minority, influenced by misinformation or cultural beliefs, as seen in 16.5% of students who expressed doubts about the efficacy of vaccination.

The study identified incomplete vaccination and international travel as key risk factors for measles outbreaks, consistent with global research by Jasmine L. Khongthaw (2022) [15] among Indian pharmacy students [15], which showed that under-vaccination remains the primary driver of measles resurgence. Environmental factors, such as low humidity and cold temperatures, were also identified as significant contributors, aligning with studies conducted in similar climates, where measles transmission peaks during winter months.

While the majority of participants recognized the importance of vaccination programs, gaps in practical knowledge were evident. For example, confusion about the appropriate age for vaccination and the role of antibiotics in treating measles symptoms indicates the need for enhanced educational initiatives. The high proportion (41.5%) of students believing that antibiotics can treat measles symptoms reflects a broader misunderstanding that has also been noted in other settings, such as in a study conducted in India by Sushil K Kabra (2013) [18].

### **Discussion of Practices:-**

In our study, 53.9% of students reported being vaccinated against measles, which is consistent with trends seen in other low- to middle-income countries, where vaccine uptake among healthcare students is often below recommended levels Vincenzo Restivo (2023) by Vaccine MDPI [19]. Practices such as the use of over-the-counter medications and dietary adjustments during measles also showed variability. For example, 68.9% of students correctly identified ibuprofen and paracetamol as the primary medications for fever management, but there was confusion about the role of antibiotics in treating measles symptoms—a misconception that underscores the need for strengthened clinical education, as similarly noted by AD Hay (2009) by Health Technology Assessment [20].

The use of dietary and immunity-boosting practices, such as the consumption of green leafy vegetables and Vitamin A supplements, was widely endorsed among participants, reflecting awareness of supportive care for measles similar research done by Andrea Lo Vecchio (2021) by Pediatric Infectious Disease Journal [21]. However, 70.9% also identified avoiding alcohol during illness, which, while beneficial, does not address core disease transmission concerns. This disconnect between knowledge and action mirrors global findings on student health behaviors during outbreaks.

Moreover, 74.3% of students demonstrated awareness of vaccination programs, yet practical engagement in promoting immunization, such as advocating for family vaccinations, remains suboptimal. These findings are consistent with studies from regions like India and Bangladesh, where student populations exhibit strong theoretical knowledge but limited involvement in public health initiatives Vincenzo Restivo (2023) by Vaccine MDPI & WHO, (2024) [19] & [22] .

To bridge the gap between knowledge and practice, targeted interventions such as integrating vaccine advocacy into medical curricula, organizing regular vaccination drives within universities, and promoting active participation in community outreach programs are recommended. These measures align with global public health strategies and could significantly reduce the re-emergence of vaccine-preventable diseases like measles.

### Conclusion:-

In conclusion, this study underscores the importance of integrating comprehensive measles education into the medical curriculum to address knowledge gaps and counter vaccine hesitancy. Future efforts should focus on improving vaccination coverage, promoting public health campaigns, and addressing misinformation. Lessons from successful vaccination campaigns, such as India's intensive measles-rubella immunization efforts, could serve as models for Kyrgyzstan to curb the re-emergence of measles. Strengthening surveillance and outbreak response strategies will be essential to achieving sustained measles control in the region.

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