HIGHLIGHTS

1. Trauma during Commemoration of 1994 Genocide against the Tutsi
2. Perceptions Toward Trauma during Commemoration of 1994 Genocide against the Tutsi
3. Predictors of Survival of preterm Newborns
4. Knowledge and Practices towards COVID-19 Prevention
5. Celebrating the World Antimicrobial Awareness Week in Rwanda

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Dr. Jean Baptiste Mazarati
University of Global Health Equity
Gregorie Muhorakeye
Rwanda Biomedical Centre

Dr. Jean Damascene Iyamuremyi
Rwanda Biomedical Centre
Dr. Jean Nepomuscene Sindikubwabo
Rwanda Biomedical Centre

Marie Fidele Muremba
Rwanda Biomedical Centre
Hassan Mugabo
Rwanda Biomedical Centre

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CONTENT

Dear readers,

It is my pleasure to introduce the latest issue of the Rwanda Public Health Bulletin (RPHB), highlighting the trauma and crises experienced during the commemoration period of the 1994 genocide against Tutsi. The 1994 genocide against Tutsi is a stark reminder of the depths of human suffering. Twenty-nine years have passed since those harrowing 100 dark days that forever impacted Rwandans, and the scars are still visible, both physically and psychologically, as survivors grapple with the aftermath of unimaginable violence, loss, and horrors.

In this publication, the RPHB reflects the multidimensional nature of the complex dynamics of trauma and crises that continue to affect individuals, families, and communities during the commemoration period. The articles within this issue offer insights into the emotional crisis and trauma cases in the commemoration period, contributing factors, coping strategies, and interventions for mitigation. They also highlight perceptions toward trauma problems and crises among victims, health service professionals, family, and friends. These articles provide valuable perspectives on the psychological impact of the genocide, the long-term effects on mental health, and the challenges survivors face in rebuilding their lives. The survivors exhibited remarkable resilience and strength through their collective healing journeys and have emerged as beacons of hope, guiding us toward a peaceful future and reconciliation.

Other topics published in this issue also focus on the survival of preterm newborns, antimicrobial resistance, and knowledge and practice toward COVID-19 prevention. This publication serves as a testament to the importance of acknowledging and understanding the long-lasting effects of the 1994 genocide against Tutsi and calls for action to provide the necessary support, resources, and interventions to address the ongoing psychological needs of survivors and their communities. This issue is also a valuable resource for all those working to improve healthcare in Rwanda and inspire new strategies and initiatives to address the public health problems presented in the articles.

I would like to thank all authors for considering the RPHB and our readers for their continued interest in the RPHB. I am confident that the insights and recommendations presented in this issue will significantly impact efforts to promote Rwandans' health now and in the future.

Sincerely,

Prof. Claude Mambo Muvunyi, MD, PhD
Editor-In-Chief -The Rwanda Public Health Bulltin (RPHB)
Director General- The Rwanda Biomedical Center (RBC)

Trauma Cases during the Commemoration Period of the Genocide against the Tutsi in Rwanda

Yvonne Kayiteshonga[1], Jean Damascene Iyamuremye[1,*], Pacifique Ndishimye[1], Vincent Sezibera[2], Clarisse Musanabaganwa[1], Nancy Misago[1], Darius Gishoma[2], Ladislas Nshimiyimana[1], Prosper Karame[1], Chaste Uwihoreye[3], Clementine Kanazayire[2], Amal Alachkar[4], Valentine Dushimiyimana[1], Patrick Rwagatare, Jean Pierre Musabyimana[1], Melanie Mukantagara[1], Vincent Tihon[5], Parfait Uwaliraye[6]

[1]*Mental Health Division, Rwanda Biomedical Centre, Kigali, Rwanda*

[2]*Mental Health Department, College of Medicine and Health Sciences, University of Rwanda, Kigali, Rwanda*

[3]*Uyisenga n'Imanzi, Kigali, Rwanda*

[4]*School of Medicine, University of California Irvine, California, USA*

[5]*Enabel-Rwanda, Kigali, Rwanda*

[6]*Rwanda Ministry of Health, Kigali, Rwanda*

ABSTRACT

Introduction: Trauma-related crises are still a national public health concern due to Genocide against the Tutsi in 1994. Thus, this research aimed to assess the emotional crisis and trauma cases in the commemoration period, contributing factors among study participants, coping strategies, and existing provided interventions during Kwibuka 24 (2018).

Methods: The study was conducted countrywide across all hospitals reporting mental health interventions provided to people experiencing an emotional crisis and trauma cases during Kwibuka 24. A total of 611 respondents were included in this study, and we used a semi-structured questionnaire for data collection.

Results: Of all respondents, 92% were female, and 8% were male. 65% of the respondents indicated that they experienced trauma symptoms after the commemoration period. From 1994 during the genocide against the Tutsi, most respondents (47%) got traumatized 24 times, while it was 18 times for the past 5 years during the commemoration period.

The majority (67%) of respondents indicated that they got all the symptoms, namely; excessive anxiety, excessive crying and sadness, unconsciousness/not knowing what is happening to them, hypervigilance, loneliness, flashbacks, numbing, being agitated, reviviscence and headache during the commemoration period. Most respondents (59.1%) indicated that poor living conditions contributed to trauma.

Conclusion: The findings showed that trauma cases were more prevalent among female genocide survivors, with poverty as the leading contributing factor and commemoration events as triggers.

INTRODUCTION

Rwanda commemorates the 1994 genocide against Tutsi every year from April 7th to July 13th, over a period of 100 days. During this period, some survivors and relatives suffer from mental health traumas and emotional crises [1]. To tackle challenges they face, Rwanda established organization and coordination of mental healthcare each year during commemoration of the 1994 Genocide against the Tutsi, all over the country [2]. This response framework has led to the creation and operationalization by the Rwanda Biomedical Centre (RBC), of a decentralized network of well-trained mental health responders throughout the country [2,3].

This Mental Health Care Delivery Model engages a diverse workforce with multidisciplinary expertise from different stakeholders to assist the population during the commemoration of the Genocide against the Tutsi [1]. These comprise community health workers, Red Cross volunteers, students who are survivors of the genocide (AERG), ambulance service providers known as Service d 'Aide Médicale d'Urgence (Pre-hospital care) (SAMU), general nurses working in health centers, mental health nurses, psychologists and medical doctors [2].

In addition, the model has led to the development of many strategic interventions to offer psychosocial support for those affected during this period. That kind of intervention continued to be implemented nationwide at different levels [3,4]. Depending on the severity of the conditions, individuals affected are referred from commemoration sites to health centers, district or referral hospitals for proper management [1]. This model supports the country in terms of ascertaining the mental health problems related to the 1994 Genocide against the Tutsi commemoration period and delivering mental health care interventions [1,5]. However, some challenges still need to be addressed to improve the long-term management of trauma cases identified during that period.

Evidence of mental health consequences of the genocide is consistently observed throughout the year, but the manifestation of traumatic memories appears to be particularly acute during periods of genocide commemoration [4], leading to repetitive traumatic crises among victims. Studies have consistently recommended continuous evaluation of these crises and research that can inform the

effectiveness of the intervention developed [1].
This study assessed the burden of emotional crises and trauma cases identified during the 2018 commemoration period of the genocide against the Tutsi. It could contribute to developing an effective approach, incorporating both the reactive and proactive approaches for the long-term management of emotional crisis and trauma cases identified during the commemoration period of the genocide against the Tutsi.

STUDY METHODS

Study Design: This study used a cross-sectional design using questionnaires. The study population included all individuals who presented emotional crisis and/or trauma (new cases or recurrent cases) during the 2018 commemoration period of the genocide against the Tutsi and who have been managed or treated at commemoration sites, Health Centers, District or Referral hospitals. Only individuals who are able to communicate are involved. Mental health care providers who have provided an intervention at least once during the commemoration period, relatives, and/or friends of people experiencing emotional crisis and trauma cases during the commemoration of the 1994 Genocide against the Tutsi in Rwanda are involved in this study.

Study sites: The study was conducted countrywide across all hospitals that report on mental health interventions provided to people experiencing an emotional crisis and trauma cases during Kwibuka 24.

Sample size and sampling techniques: For quantitative data, random sampling was used to select respondents from a list of individuals provided by the hospitals. In addition, a replacement list was also generated randomly to serve in case a respondent was not available for the study.

Daniel's 1999 formula was used to calculate the sample size during the quantitative data collection. Whereby;

$$n=z^2xp(1-p)$$

n is the sample size, z is the statistic for a level of confidence (for a level of confidence of 95%, which is conventional, the z value is 1.96), p is

the expected prevalence or proportion (considered as 0.5), d is the precision (considered as 0.05 to produce good precision and smaller error of the estimate. With a Continuous Interval at 95%, the non-response rate of 3% and design effect of 1.5 was considered using Daniel's formula.

Therefore, from the formula above;
n=1.962 * (0.5(1-0.5))= 384.16
Sample size when the response rate was considered: =384/(1-0.03 none response rate) = 384/0.97= 395.87= 396
Sample size when design effect (Deff) was considered = 396*1.5= 594

Therefore, the final sample size was 594, and 611 participants were included to compensate for the non-response possibility.

Questionnare: Semi-structured questionnaire was used for data collection. The questionnaire collected information such as sociodemographic data: age, level of studies, occupation, religion, "Ubudehe" category, health insurance, marital status, and information about one's household, for example, whether one lives with other people, the relationship one has with the people he/she lives with, a number of people one lives with, and household role.

Information about trauma included: comorbidities (chronic diseases), distance to the nearest health center, symptoms during the Kwibuka 24 commemoration period and in the previous 5 years, trauma symptoms, triggers of trauma crisis, contributing factors to trauma crisis, coping strategies to overcome emotional crisis/trauma crisis, services offered during and after the commemoration period and the support that should be strengthened and introduced in order to improve the services offered to people experiencing trauma crises.

Data collection and analysis: For quantitative data, data collectors were trained and provided with a list of respondents from records of trauma crisis cases during the Kwibuka 24 commemoration period. These records are kept at various hospitals across the country. The data collectors made contact with respondents via telephone, and appointments were made. We then collected data using a tablet with questionnaires designed using ODK in Kinyarwanda.

Data were extracted, cleaned, and stored in Excel. This data was analyzed using SPSS for descriptive statistics and the generation of graphs, tables, and pie charts.

Ethical consideration: Ethical approval from the Rwanda National Ethics Committee (RNEC) was obtained prior to the conduct of the study. Informed consent was obtained from the participants by signing consent forms. Participation in the survey was voluntary, and all necessary logistics to facilitate the study were provided. The transcripts and quantitative datasets were kept in a password-protected computer to ensure the confidentiality and anonymity of respondents.

RESULTS

The results indicated that; 92% of respondents were female and 8% were male. Most (31%) were between 26 to 34 years, followed by 22% who were between 35 to 44 years, and 20% between 45 to 54 years. The majority (47%) had a primary school education level, followed by 30% who had a secondary school education, and 20% illiterate. Over half (55%) of respondents were farmers, and 29% were self-employed. The vast majority (91%), while only 9% were Muslims. Most (41%) belonged to Ubudehe II, and Ubudehe III (35%). The vast majority (93%) of the respondents had health insurance, and community-based health insurance (CBHI) was the most popular (89.5%). Most lived with other people (92%), were household heads (63%), and were married (37%). Table 1 shows sociodemographic information of the respondents.

As seen in Table 2, 64% had comorbidities with chronic diseases, and 36% had no comorbidity with chronic diseases. Most had single chronic diseases (59%), while 32% of the respondents had a combination of chronic diseases.

As seen in Figure 1, two-thirds (65%) of the respondents reported having experienced trauma symptoms after the commemoration period and from the 1994 Genocide against the Tutsi.

In the past 5 years and after the 2018 commemoration period, most participants who were traumatized were women, in the age group between 26 to 34 years, with primary education

Table 1: *Sociodemographic characteristics of the respondents*

		Frequency	%
	Female	561	92
Gender	Male	50	8
	25 and below	68	11
	26-34	187	31
	35-44	134	22
	45-54	123	20
Age	55 and above	99	16
	Illiterate and primary not completed	120	20
Level of Education	Primary	285	47
	Secondary School/TVET	182	30
	University	24	4
	Salaried employee	12	2
	Self-employed	177	29
	Unemployed	31	5
	Farmers	336	55
Occupation	Cleaners	36	6
	Artisans	18	3
	Missionaries	1	0.2
	Christian	558	91
Religion	Muslim	53	9
	"Ubudehe" I	127	21
"Ubudehe" Category	"Ubudehe" II	251	41
	"Ubudehe" III	213	35
	"Ubudehe" IV	20	3
	CBHI	547	89.5
	RSSB	15	2.5
	MMI	4	0.7
Health Insurance	No insurance	43	7
	Private insurance	1	0.2
	Refugees card	1	0.2
	Yes	564	92
Do you live with other people?	No	47	8
	Alone	47	8
Number of people one lives with	1 to 3	281	46
	4 to 6	217	36
	above 7	66	11
	Children	271	48
	Siblings	38	7
	Parents	231	41
	Friend	6	1
Relationship with the people one lives with	Relatives	15	3
	House help	3	1
	Head of Household	354	63
	Dependents	127	23
	Housewife	74	13
Household role	House help	9	2
	Married	226	37
	Single	177	29
	Widow/widower	128	21
	Separated	67	11
Marital status	Divorced	12	2

level, married, farmers by occupation, and in Ubudehe 2 (appendix). Most respondents reported that they got traumatized 24 times, while for the past 5 years during the commemoration period, most reported being traumatized 18 times. During the period the non-commemoration period, the majority of the respondents reported that they got traumatized 9 times (Figure 2).
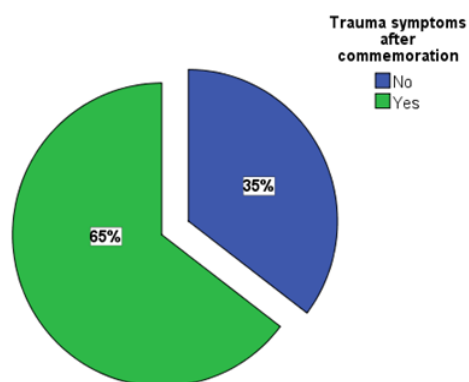
Figure 1: *Trauma symptoms after the commemoration*

■ Since 1994 genocide

■ Past 5 years during commemoration

■ During a period that is not commemoration
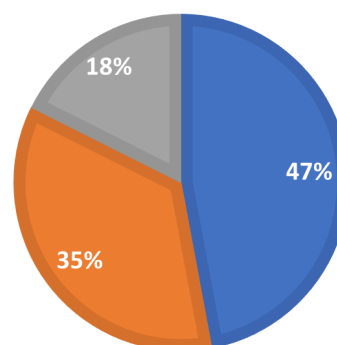
Figure 2: *Occurrence of trauma*

As seen in Table 3, most (67%) participants got all the symptoms, namely, excessive anxiety, excessive crying and sadness, unconsciousness/not knowing

Table 2: *Comorbidities reported by participants*

Chronic diseases	Frequency	Percentage	Percentage
Yes	390	64	
No	221	36	

Categories	Chronic diseases	Frequency	Percentage
	HIV	67	17
	Diabetes	79	20
Single chronic diseases	Hypertension	84	22
	HIV and Hypertension	62	16
	HIV, Diabetes	28	7
Combination of chronic diseases	Hypertension, Diabetes	36	9
	Chronic headache	10	3
	mental illness	8	2
	history of stroke	2	0.5
	Kidney disease	2	0.5
	Stomachache	2	0.5
	Asthma	6	2
Other chronic diseases	Hepatitis	4	0.5
Total	Total	390	100

Table 3: *Trauma symptoms manifested during the commemoration period and triggers*

Trauma symptoms	Frequency	Percentage
No response to the question	51	8
Flashback, numbing, reviviscence	55	9
Flashbacks, loneliness	30	5
Excessive anxiety, headache, Unconsciousness, crying, and sadness	65	11
All symptoms	410	67
Total	611	100
Triggers	**Frequency**	**Percentage**
Genocide memorial	35	6
Commemoration period	148	25
Genocide denial and ideology	35	6
Traumatic memories	70	11
Poor living conditions	107	18
Burials	15	2
Disabilities	12	2
Diseases contracted during the genocide	25	4
Family conflicts	15	2
Insults	13	2
Loneliness	40	7
Contact with perpetrators	32	5
Photographs of the deceased	10	2
No response	54	9
Total	611	100

what is happening to them, hypervigilance, loneliness, flashbacks, numbing, being agitated, reviviscence and headache. A quarter (25%) of the respondents reported that they are triggered by the commemoration period (date itself, movies, songs, and testimonies during that period); followed by 18% triggered by poverty and 11% triggered by bad memories of what happened to them and their loved ones during the genocide against Tutsi.

The findings revealed that most (59.1%) respondents considered poor living conditions (lack of income, shelter, school fees, and unemployment) as predisposing/perpetuating factors, followed by 13.6% of the respondents who did not respond to the question, while 5.7% indicated that family conflicts, for example, conflicts in marriages and with members within the communities as factors, and 5.6% mentioned

insults from the community members as factors. To cope with the crisis, 23% of respondents reported approaching health service providers to help them overcome the trauma; 19% preferred a quiet place; 13% joined support groups formed by fellow survivors within the communities; 13% cried, making them feel better (Table 4).

It was observed that 51% of participants took less than 30 minutes, 36% took between 31 to 60 minutes, and 13% took longer than 61 minutes on average to walk to the nearest health center (Figure 3). The majority (87%) indicated that they received professional services, whereas 13% of respondents did not receive any professional services during the 2018 commemoration period of the genocide against the Tutsi, as shown in Figure 4.
Most (42%) indicated that they met health advisors

Table 4: *Contributing factors to trauma and coping strategies*

Contributing factors to trauma	Frequency	Percentage
Commemoration period	6	1.0
Genocide ideology	4	0.7
Traumatic memories	3	0.5
Poor living conditions	361	59.1
Disabilities	14	2.3
Diseases	32	5.2
Family conflicts	35	5.7
Insults	34	5.6
Loneliness	27	4.4
Contact with perpetrators	4	0.7
Bad service	8	1.3
No response	83	13.6
Total	611	100
Coping strategies	**Frequency**	**Percent**
No response to the question	51	8
Solitude	119	19
Acceptance of their situation	55	9
Approach health service providers	142	23
Support groups	82	13
Engaging in different activities (sports, music, praying, writing)	54	9
Crying	80	13
Family support	28	5
Total	611	100

and had access to treatment and medication from different health centers, such as sleeping pills; 28% had access to counseling services from different service providers; 18% sought aid from different support groups. During crises, a third (36%) go to health centers, 35% go to district hospitals 9% go to villages, 7% get help from their homes, 6% go to their friends, 5% seek help from organizations like The Association of the Genocide Widows Agahozo (AVEGA-Agahozo and the University Teaching Hospital of Kigali (CHUK), 4% sought services from the church and 1% received services from their schools (Table 5).

Over three-quarters (76%) said that they did not continue to get services after the commemoration period, while 24% indicated that they continued to get services like; medical insurance, cows, food, basic needs, shelter, iron sheets, counseling, financial aid like school fees allowance and house rent from the Genocide Survivors Assistance Fund (FARG), Vision 2020 Umurenge Programme (VUP), CARITAS, and AVEGA Agahozo after the commemoration period (Figure 5).

The findings revealed that 39% needed easy access to more counseling services after the commemoration period to help people heal from the trauma they are suffering from, including monitoring the trauma victims by the counselors and making home visits.

Table 5: *Services respondents accessed during the 2018 Commemoration period of the genocide against the Tutsi*

Services	Frequency	Percentage
Health advice, treatment, and medication	205	42
Financial aid from a support organization	44	9
Follow up programs	15	3
Counseling	136	28
Support groups	87	18
Total	487	100
Service points	**Frequency**	**Percent**
Health center	175	36
District Hospital	166	34
Villages	43	9
Home	32	7
Organizations like CHUK, AVEGA-Agahozo, etc.	22	5
Schools	3	1
Friends	28	6
Church	18	4
Total	487	100

AVEGA: The Association of the Genocide Widows Agahozo; CHUK: University Teaching Hospital of Kigali
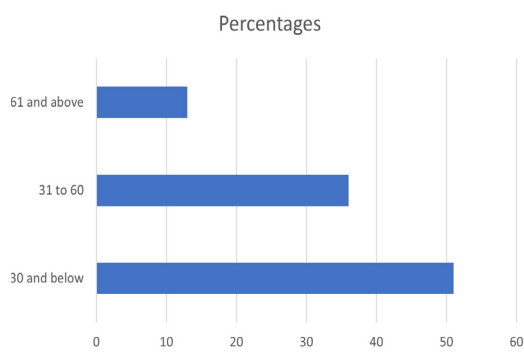
Figure 3: *Use of services to overcome trauma crisis during the 2018 commemoration period of the genocide against Tutsi*
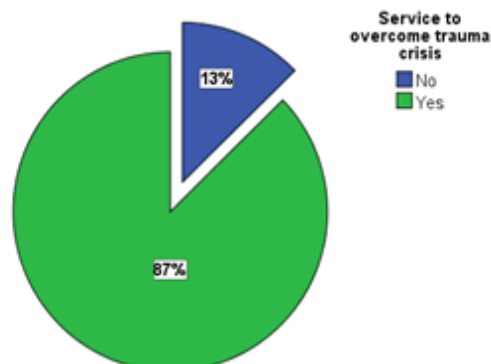
Figure 4: *Use of services to overcome trauma crisis during the 2018 commemoration period of the genocide against Tutsi*
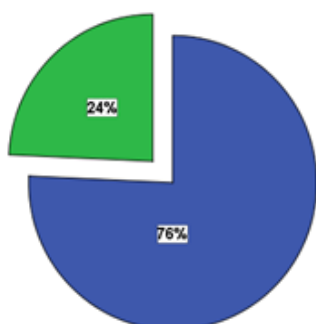
Figure 5: *Access to services after the 2018 commemoration period*

Twenty three percent indicated the need for more financial support (shelter, allowance, food, and funds to start businesses). However, 13% said nothing should be strengthened since they were satisfied with the services offered (Table 6). When asked what needs to be introduced, 48% of the respondents requested more counseling and follow-up sessions, most especially for people experiencing trauma even after the commemoration period, 12% said that there was a need to train trauma counselors and also family

Table 6: *Support that needs to be strengthened or introduced*

Support that needs to be strengthened	Frequency	Percentage
No response to the question	52	9
Easy access to more counseling	239	39
Training counselors	15	2
Increase in the number of counselors	47	8
Financial support	143	23
Satisfied	82	13
Support groups	17	3
Trauma sensitization to stop stigmatization	16	3
Total	611	100
What needs to be introduced	**Frequency**	**Percentage**
No answer	51	8
Need for support groups	55	9
Counseling and follow up	293	48
Training counselors	72	12
Advocacy	23	4
Financial support	71	12
Increase in the number of counselors	35	6
Satisfied	11	2
Total	611	100

members with children who are experiencing trauma, 12% also indicated that there was a need for financial support to the people experiencing trauma.

DISCUSSION

Following the 1994 Genocide against the Tutsi, Rwandan society was severely impaired and could not function optimally [2], with a large burden of mental health disorders, which can be linked to the genocide against the Tutsi [5,7].

This study's findings revealed that 92% of respondents are female, indicating a higher trauma prevalence in women than men since women were 51.8% of the Rwandan population [8]. This might be due to the fact that women are more prone to PTSD than men, as evidenced by previous studies [9,10]. Research has also shown that women are more likely than males to experience PTSD even when subjected to similar stress [10]. Women have been found to be 2-3 times more prone to PTSD than men [11]. One of the suggested reasons is women's higher risk of sexual assault,

which is itself associated with the highest rates of PTSD [10]. In addition, it is hypothesized that women may experience additional role strain when their ability to perform gendered social roles (such as wife, mother, or caregiver) is hampered by traumatic experiences or stress reactions, aggravating the detrimental effects of trauma exposure and leading to more likelihood of experiencing trauma related crisis [9,12].

We found a downward trend of traumatic events from 24 events since the 1994 Genocide against the Tutsi, to 18 events for the past 5 years during the commemoration period to 9 events in non-commemoration period. This may be attributed to the continuous government support rendered to several victims, increasing service providers like counselors, and health practitioners who care for victims, and providing trauma awareness, enabling them to easily seek help from different hospitals and organizations [13].

The majority of respondents got all the trauma symptoms, mostly triggered by the commemoration period due to coinciding dates

of the month they experienced trauma in 1994, movies, poems, songs, and testimonies, reflecting what happened during the 1994 Genocide against Tutsis. Our findings align with previous research that showed that the most common triggers are stimuli similar to the traumatic event's stimuli, such as sights, sounds, smells, or reminding thoughts of the traumatic event [14].

Research has also shown that those in poverty, who are discriminated against, disabled, and homeless, are more vulnerable to trauma and develop PTSD [15,16]. This may be worsened by familial and societal conflicts [17]. This aligns with our study's findings that poverty, family conflicts, and insults from the community as perpetuating factors for most respondents, but also disability and diseases acquired from genocide traumatic events. More than two-thirds of respondents mentioned poverty as a contributing factor, which is consistent with previous studies showing that poverty is associated with more risk of PTSD and other mental illnesses, especially among women and others with a history of traumatic experience [18,19], the similar respondents (92% female genocide survivors) in our study. Moreover, research has indicated that youth and interpersonal violence increase the risks of PTSD [19], supporting our findings and indicating that our respondents, mostly young, are at higher risk.

The most common approach to get help for our study respondents was to visit service providers, such as counselors and medical professionals, to help them overcome the trauma crisis [20]. In countries that are recovering from war or genocide, individual counseling, group counseling, and support groups have been reported to curb the symptoms and crisis [20,21]. A study on a supportive-expressive group therapy model by mental health nurses for traumatic crisis victims during genocide commemoration in Rwanda found that it significantly reduces loneliness feelings and some negative emotions [1]. At each commemoration site, there are support groups made of service providers to help victims in crises, and they are free of charge [5]. This is why the majority of the respondents indicated that they received professional services during the 2018 commemoration period of the Genocide against Tutsi directly at genocide commemoration sites. However, most reported that they did not continue to get services after the commemoration period.

This might be because the service providers have no follow-up program, especially after offering services to these victims during the commemoration period.

CONCLUSION

The majority of the sampled population experienced trauma symptoms after the commemoration period; however, trauma symptoms keep dropping due to care services established by the government and the increased help rendered by the service providers during the commemoration period.

Most respondents indicated that they received professional services during the 2018 commemoration period of the Genocide against Tutsi. These people indicated that there are support groups that the service providers at the sites make, and these have helped them access these services more freely and easily. However, they indicated that they don't continue to get services after the commemoration period. Most factors leading to crises are socio-economic, with poverty being the most commonly reported factor. Therefore, the government should empower the genocide survivors and their families through financial support by providing them with basic needs like shelter, allowance, food, and funds to start businesses. Government should help them have access to health insurance to get access to care. Efforts should be put into eradicating genocide ideology and enhancing unit.

The Ministry of National Unit and Civic Engagement should collaborate with the Ministry of Health and other partners to establish an effective approach to build and implement a tailored intervention model for the long-term management of emotional crisis and trauma cases identified during the commemoration period of the genocide against the Tutsi.

REFERENCES

[1] D. Gishoma, J.-L. Brackelaire, N. Munyandamutsa, J. Mujawayezu, A. A. Mohand, and Y. Kayiteshonga, 'Remembering and Re-Experiencing Trauma during Genocide Commemorations: The Effect of Supportive-Expressive Group Therapy in a Selected District Hospital in Rwanda', RWJour, vol. 2, no. 2, p. 46, Nov. 2015, doi: 10.4314/rj.v2i2.8F.

[2] J. Iyamuremye and R. White, 'Integrated Care Model Developed by the Rwanda Biomedical Center for Decentralization of Psychological Interventions during Commemoration of Genocide against Tutsi in Rwanda', RWJour, vol. 2, no. 1, p. 80, Oct. 2015, doi: 10.4314/rjhs.v2i1.11F.

[3] C. Musanabaganwa et al., 'Burden of post-traumatic stress disorder in postgenocide Rwandan population following exposure to 1994 genocide against the Tutsi: A meta-analysis', Journal of Affective Disorders, vol. 275, pp. 7–13, Oct. 2020, doi: 10.1016/j.jad.2020.06.017.

[4] Rwanda MOH, 'Rwanda's Performance in Addressing Social Determinants of Health and Intersectoral Action', Ministry of Health Rwanda, 2015. [Online]. Available: https://www.afro.who.int/publications/rwandas-performance-addressing-social-determinants-health-and-intersectoral-action

[5] D. Gishoma, J. L. Brackelaire, N. Munyandamutsa, J. Mujawayezu, A. A. Mohand, and Y. Kayiteshonga, 'Supportive-Expressive Group Therapy for People Experiencing Collective Traumatic Crisis During the Genocide Commemoration Period in Rwanda: Impact and Implications', J. Soc. Polit. Psych., vol. 2, no. 1, pp. 469–488, Aug. 2014, doi: 10.5964/jspp.v2i1.292.

[6] S. Rudahindwa et al., 'Transgenerational effects of the genocide against the Tutsi in Rwanda: A post-traumatic stress disorder symptom domain analysis', AAS Open Res, vol. 1, p. 10, Apr. 2018, doi: 10.12688/aasopenres.12848.1.

[7] Rwanda MOH, 'Health Service Packages for Public Health Facilities', Ministry of Health Rwanda, 2017. [Online]. Available: https://www.moh.gov.rw/fileadmin/user_upload/Moh/Publications/Legal_Framework/Public_health_Facilities_service_packages_in_Rwanda-1.pdf

[8] NISR, 'Fourth Population and Housing Census - 2012', 2012. [Online]. Available: https://www.statistics.gov.rw/datasource/42

[9] H. E. Ainamani, T. Elbert, D. K. Olema, and T. Hecker, 'Gender differences in response to war-related trauma and posttraumatic stress disorder – a study among the Congolese refugees in Uganda', BMC Psychiatry, vol. 20, no. 1, p. 17, Dec. 2020, doi: 10.1186/s12888-019-2420-0.

[10] D. F. Tolin and E. B. Foa, 'Sex differences in trauma and posttraumatic stress disorder: A quantitative review of 25 years of research.', Psychological Bulletin, vol. 132, no. 6, pp. 959–992, 2006, doi: 10.1037/0033-2909.132.6.959.

[11] A. E. Pooley et al., 'Sex differences in the traumatic stress response: PTSD symptoms in women recapitulated in female rats', Biol Sex Differ, vol. 9, no. 1, p. 31, Dec. 2018, doi: 10.1186/s13293-018-0191-9.

[12] M. Olff, W. Langeland, N. Draijer, and B. P. R. Gersons, 'Gender differences in posttraumatic stress disorder.', Psychological Bulletin, vol. 133, no. 2, pp. 183–204, 2007, doi: 10.1037/0033-2909.133.2.183.

[13] CNLG, 'Kwibuka 25 25th commemoration of the genocide against the Tutsi', National Commission for the Fight against Genocide, 2019. [Online]. Available: http://kwibuka.rw/wp-content/uploads/2019/03/Kwibuka25_Booklet_English_Web.pdf?_t=1555320706

[14] B. Kleim, B. Graham, R. A. Bryant, and A. Ehlers, 'Capturing intrusive re-experiencing in trauma survivors' daily lives using ecological momentary assessment.', Journal of Abnormal Psychology, vol. 122, no. 4, pp. 998–1009, Nov. 2013, doi: 10.1037/a0034957.

[15] T. S. Betancourt, S. Abdi, B. S. Ito, G. M. Lilienthal, N. Agalab, and H. Ellis, 'We left one war and came to another: Resource loss, acculturative stress, and caregiver–child relationships in Somali refugee families.', Cultural Diversity and Ethnic

Minority Psychology, vol. 21, no. 1, pp. 114–125, 2015, doi: 10.1037/a0037538.

[16] R. E. Goldsmith, C. G. Martin, and C. P. Smith, 'Systemic Trauma', Journal of Trauma & Dissociation, vol. 15, no. 2, pp. 117–132, Mar. 2014, doi: 10.1080/15299732.2014.871666.

[17] I. A. Kira et al., 'Cumulative Tertiary Appraisals of Traumatic Events Across Cultures: Two Studies', Journal of Loss and Trauma, vol. 16, no. 1, pp. 43–66, Jan. 2011, doi: 10.1080/15325024.2010.519288.

[18] C. E. Golin et al., 'Post-traumatic Stress Disorder Symptoms and Mental Health over Time among Low-Income Women at Increased Risk of HIV in the U.S', J Health Care Poor Underserved, vol. 27, no. 2, pp. 891–910, 2016, doi: 10.1353/hpu.2016.0093.

[19] E. K. Lenart et al., 'Youth, poverty, and interpersonal violence: a recipe for PTSD', Trauma Surg Acute Care Open, vol. 6, no. 1, p. e000710, Apr. 2021, doi: 10.1136/tsaco-2021-000710.

[20] C. E. Sakai, S. M. Connolly, and P. Oas, 'Treatment of PTSD in Rwandan child genocide survivors using thought field therapy', Int J Emerg Ment Health, vol. 12, no. 1, pp. 41–49, 2010.

[21] J. D. Ford, D. J. Grasso, J. D. Elhai, and C. A. Courtois, Posttraumatic stress disorder: scientific and professional dimensions, Second edition. Amsterdam ; Boston: Elsevier/AP, Academic Press is an imprint of Elsevier, 2015.

Perceptions Toward Trauma Problems and Crises during the Genocide against the Tutsi Commemoration Period

Yvonne Kayiteshonga[1], Jean Damascene Iyamuremye[1,*], Pacifique Ndishimye[1], Vincent Sezibera[2], Clarisse Musanabaganwa[1], Nancy Misago[1], Darius Gishoma[2], Ladislas Nshimiyimana[1], Prosper Karame[1], Chaste Uwihoreye[3], Clementine Kanazayire[2], Amal Alachkar[4], Valentine Dushimiyimana[1], Patrick Rwagatare, Jean Pierre Musabyimana[1], Melanie Mukantagara[1], Vincent Tihon[5], Parfait Uwaliraye[6]

[1]*Mental Health Division, Rwanda Biomedical Centre, Kigali, Rwanda*

[2]*Mental Health Department, College of Medicine and Health Sciences, University of Rwanda, Kigali, Rwanda*

[3]*Uyisenga n'Imanzi, Kigali, Rwanda*

[4]*School of Medicine, University of California Irvine, California, USA*

[5]*Enabel-Rwanda, Kigali, Rwanda*

[6]*Rwanda Ministry of Health, Kigali, Rwanda*

ABSTRACT

Introduction: Following the Genocide against the Tutsi in 1994, Rwandan society was severely impaired and could not function optimally, with an exceptionally large burden of mental health disorders. Therefore, this study aimed to evaluate the perceptions of trauma victims, family/friends of the victims, and health service professionals toward trauma problems and crises they face during the genocide against the Tutsi commemoration period.

Methods: This was a qualitative study using a focused group discussion approach (FGD) involving trauma victims who had trauma crises during the period of Kwibuka 24, their family/friends, and health service professionals, and using An FGD guide was used to guide the discussions.

Results: The results from the focus group discussions show increased trauma, especially among post-genocide children and the elderly and widowed survivors. Poverty, flashbacks, and the commemoration period are common key triggers of trauma crises. The main challenges include HIV/AIDS, stigmatization from within the community, poverty, inadequate service providers, lack of follow-ups, genocide ideology within the communities, and unprofessional service providers. Common strategies to cope with trauma include solitude, approaching service providers, joining support groups, and engaging in different activities.

Conclusion: This study showed the rising trauma crises among descendants of genocide survivors. The findings also highlight the need for targeted measures, including financial, emotional, and health support for survivors tackling the identified triggers.

INTRODUCTION

In 1994, Rwanda experienced genocide against the Tutsi, which led to an extensive loss of human life, talents, and resources. Consequently, Rwandan society was severely impaired and could not function optimally [1]. Rwanda faces an exceptionally large burden of mental health disorders, and much of the country's burden of mental disorders can be linked to the genocide against the Tutsi [2].

In addition, the genocide survivors are devastated by the loss of all they had known, resulting in massive, unspeakable suffering (MoH, 2012). The Genocide against the Tutsi generated multiple and massive stressors that may lead to severe and long-lasting Post Traumatic Stress Disorders (PTSD) among its survivors. PTSD is among the most serious mental health disorders affecting the Rwandan population. Its prevalence ranges from 26% among adults to 41% among women survivors [3,4], and there is strong evidence for the transgenerational transmission of PTSD [5]. Evidence of mental health consequences of the genocide is consistently observed throughout the year, but the manifestation of traumatic memories appears to be particularly acute during periods of genocide commemoration [6].

Each year, for a period of 100 days, Rwanda commemorates the genocide against the Tutsi. According to the Ministry of Health, during the commemoration period of the genocide against the Tutsi, there is a large number of people experiencing emotional crises [7]. These emotional crises are often collective and create distress among the people who are participating in the events. They are accompanied by extreme emotional episodes, which create a resurgence of memories from the genocide itself [1]. As a result, there arises re-traumatization that requires intervention by mental health professionals and hospitalization when severe. When such crises are not managed properly or when there is a lack of effective interventions, they may create extreme anxiety and panic among genocide survivors and different individuals participating in commemorative events.

In light of the challenges posed by the above-mentioned issues, Rwanda emphasizes providing care to individuals experiencing trauma during the commemoration. Current practices include the organization and coordination of mental healthcare each year during the commemoration of the 1994 Genocide against the Tutsi, all over the country [1] This response framework portrays a Mental Health Care Delivery Model where healthcare professionals implement a chain of communication and a plan for mass interventions throughout the commemoration at each level of the health system in Rwanda [8]. According to the Rwanda Ministry of Health, trauma-related crises remain a national public health concern. During Kwibuka 24, 4,363 cases were handled at commemoration sites, health centers, district, and provincial hospitals [8]. Only a few studies have been conducted on the emotional crisis and trauma cases identified during the commemoration period. Reports from MoH and other studies have also recently reported some complex trauma cases with new symptomatology and possible recurrent cases [8,9]. In addition, the lack of a proper follow-up system for people who present repetitive crises during commemoration was reported [9]. All of these highlight the need for more research on this burden to inform strategies designed to mitigate the crises and improve genocide survivors' well-being. Therefore, this study aimed to evaluate the perceptions of trauma victims, family/friends of the victims, and health service professionals toward trauma problems in their communities, trauma trigger events, how they react when victims experience trauma symptoms, challenges faced by victims and services that need to be strengthened in order for victims to cope with trauma.

METHODS

Study design and site: This study used a cross-sectional design with the qualitative approach using Focus Group Discussions (FGD). The study was conducted countrywide across all hospitals that report on mental health interventions provided to people experiencing an emotional crisis and trauma cases during Kwibuka 24 in 2018.

Study population: The study population included all individuals who presented emotional crisis and/or trauma (new cases or recurrent cases) during the 2018 commemoration period of the genocide against the Tutsi and who have been managed or treated at commemoration sites, Health Centers, District or Referral hospitals, and who were able to communicate are involved. We also included

mental health care providers who have provided an intervention at least once during the commemoration period, relatives and/or friends of people experiencing emotional crises and traumatic events during the commemoration of the 1994 Genocide against the Tutsi in Rwanda. In this study, we will refer to the participants as discussants.

Sample size and sampling techniques: A purposive sampling technique was used to select Discussants for the qualitative study. Daniels's 1999 formula was used to calculate the sample size during the quantitative data collection. Whereby;

$n = z_2 * p(1-p)$

n is the sample size, z is the statistic for a level of confidence (for a level of confidence of 95%, which is conventional, the z value is 1.96) p is the expected prevalence or proportion (considered as 0.5), d is the precision (considered as 0.05 to produce good precision and smaller error of the estimate. With a Continuous Interval at 95%, the non-response rate of 3% and design effect of 1.5 was considered using Daniels's formula. Therefore, from the formula above;

$n = 1.96_2 * (0.5(1-0.5)) = 384.16$

Sample size when response rate is considered:
$= 384 / (1-0.03 \text{ none response rate}) = 384/0.97 = 395.87 = 396$

Sample size when Design effect (Deff) is considered:
$= 396 * 1.5 = 594$

Therefore, the final minimum sample size was 594, and 611 participants were included in this study.

Study instruments: For qualitative data, FGDs were used for three categories of Discussants namely; trauma victims, health care providers, and family and friends of the trauma victims. Five FGDs each composed of 8 participants are conducted for each category of Discussants. An FGD guide was used to guide the discussions.

Data collection process: Data was collected through Focus Group Discussions (FGDs) with three groups of Discussants namely: victims of trauma during the 2018 commemoration period of the Genocide against Tutsi; relatives or friends of the trauma victims and health service

providers. Participants for the 3 categories of focus groups were identified considering their gender, age and their place of residence. An FGD guide facilitated the discussions and all proceedings were recorded using a voice recorder.

Data management and analysis: The data collected for the qualitative study are recorded and transcribed. This information was collected in Kinyarwanda. All transcripts/narratives were validated and translated to English for analysis. The software package used for qualitative analysis was Max QDA. The FGD transcripts were analyzed using scissors and sort techniques and content analysis. The steps included the following techniques:

1. The transcripts were read through and the sections of it that are relevant to the research question(s) were identified. Based on this initial reading, a classification system for major topics and issues was developed, and material related to each topic was identified in the transcript.

2. Color-coded brackets or symbols were then used to mark different topics within the text with colors. The amount of material coded for any one topic depended on the importance of that topic to the overall research question and the amount of variation in the discussion. The coded materials were phrases, sentences, or long exchanges between individual Discussants.

3. Once the coding process was complete, the coded copy of the transcribed interview was cut apart (the scissors part of the technique). Each piece of coded material was cut out and sorted so that all material relevant to a particular topic was placed together. This cutting and sorting process was readily carried out on a computer with a word-processing program.

4. Each topic was treated in turn with a brief introduction. The various pieces of transcribed text were used as supporting materials and incorporated into an interpretative analysis. Important segments of the transcript were categorized for the topics discussed by the group; representative statements regarding these topics from the transcript were selected and interpreted. Findings in an engaging narrative were written down to describe the themes and the quotations.

2. Most of the data was coded, and Max QDA

was used to develop the different narratives for each topic.

Ethical considerations: Ethical approval from Rwanda National Ethics Committee (RNEC) was obtained prior to the conduct of the study. Informed consent was obtained from the participants by signing consent forms. Participation in the survey was voluntary, and all necessary logistics to facilitate the study were provided. The transcripts were kept in a password-protected computer to ensure the confidentiality and anonymity of the discussants. Focus groups gathered in a safe, comfortable, and private location.

RESULTS

Perception of victims of trauma

Trauma victims indicated increased trauma, especially among postgenocide children and the elderly and widowed survivors around the places where they live. Discussants indicated that postgenocide children get to learn about the atrocities committed during the genocide against the Tutsi in school and during the commemoration period, thereby getting traumatized.

"I am a small child, but there are problems we have as children from families of survivors of Genocide, and you find your parent doesn't have a family when he/she tells you the Genocide history, it hurts you, and you fail to manage it or when you see the kind of life your parent live you get trauma, other young people around us say that we are acting because we didn't see what happened during the Genocide, but you find that many children have trauma because of their families, there is a time you find a child's thoughts are beyond his/her age," Discussant D from Group 2, 20 years old noted.

The old widows and the elderly are also traumatized because they are lonely, and have scars and traumatic memories from the 1994 Genocide against the Tutsi. An elderly discussant was quoted saying: *"I go to the hospital for treatment and have nobody to take care of me and the trauma cannot end. Most of the time trauma is due to loneliness and also when I look at the scars on my body."*

The victims of trauma also further noted that there

is stigmatization and genocide ideology in the communities. This stigmatization has made many people get discouraged from seeking help hence resulting in chronic trauma. *"The problem I share with my fellow Discussants is that people in the neighborhood don't understand what trauma is. They only attach value to us in April. Even if I may be telling the truth, people will say I am mad. Even when you invited me for this discussion, they started gossiping that I was taken to Neuro-Psychiatric Hospital in Ndera to have my madness screened,"* V5, aged 31, Group 5.

Perception of friends and family of victims of trauma

Friends and family of victims of trauma also indicated that there are increased trauma cases within their neighborhoods. Discussants noted that there is increased trauma amongst, especially postgenocide children and the elderly. F8 from Group 3 noted: *"I would also like to corroborate my fellow Discussants and say that trauma is in both groups. Elderly survivors and young people who didn't experience the horrors of the genocide against the Tutsi. This is true because we currently find young people getting traumatized, yet they were born in the postgenocide period. On both sides, the children born of survivors and those born of genocide convicts get traumatized. As for elderly survivors, they get traumatized due to lacking people to support or render service, yet they had children who were killed in the genocide."*

Friends and family also noted, however that there is reduced trauma in their communities because the government has continuously supported survivors, and counselors have helped many survivors cope with trauma. Most people only witness trauma during commemoration and whenever they go to the memorial sites. Discussant F2 from Group 5, a 40-year-old male, notes: "*Comparing to what happened last year, we may say that trauma cases are abating, as my fellow Discussant has said. This is true because long ago, one could get traumatized by the fact that they stayed alone in the family, but with the support being rendered to survivors, victims all end up braving the odds.*"

Perception of health service providers

The service providers observed that trauma cases

around the places where service is offered is complex. They noted that there is increased trauma amongst the elderly and from the post-genocide generation, as earlier asserted by the other group of discussants. The elderly have traumatic memories, PTSD, scars, poor standard of living, diseases, and are lonely hence making their trauma issue complex, while amongst the youths, most of the children born of genocide convicts get traumatized once they find out what their parents did in the past, they find it hard to accept why they took part in the genocide and the ones born of genocide survivors get traumatized because they lack closure of what happened. *"Trauma is at the highest rate to the extent that it is not only found among elderly people but also among postgenocide generations. People wonder how possible this can be. For example, we sometimes join schools to commemorate the genocide against the Tutsi and find young men and ladies being traumatized because of originating from families affected by the genocide,"* noted PBA from Group 3.

Trigger events indicated by victims of trauma

A couple of trigger events lead to the manifestation of the trauma symptoms by the people who experienced trauma during Kwibuka 24. Participants indicated that flashbacks, poverty, the commemoration period, lack of closure from released genocide perpetrators, testimonies from other genocide survivors, domestic violence and visible wounds like scars and other diseases are key triggers to their trauma crises.
"When the commemoration date arrives, one remembers a lot of things, the mood changes, you remember so many things. On the commemoration date, when I go to the stadium, I have a problem. The crowd of many people causes me trauma, and the noisy place also causes me trauma. When something makes a loud noise abruptly, I lose my mind." Discussant B from Group 2, a 40-year-old woman, noted with deep sorrow.

Trigger events indicated by family and friends of victims of trauma

Victims' Family and friends cited many events, which trigger trauma symptoms in the victims. They indicated that poverty contributes heavily to the trauma of their friends or family member. Other triggers cited include the commemoration period, testimonies from other genocide survivors of how they suffered and lost their family members, commemoration songs and poems that are mainly sung during the commemoration, lack of closure because most of them are surrounded by people who took part in the genocide. Hence, they get traumatized every single day by being in contact with the perpetrators, diseases like HIV/AIDS that they have to live with, memories most especially about their deceased victims and genocide ideology amongst some members of the community.

Discussant B from Group 4, a 27-year-old man, noted: *"Another thing causing trauma is seeing bodies of other people, and you have not yet seen yours and buried them in dignity. In addition, the punishments of most genocide perpetrators are coming to an end, and they are being released, yet survivors are not prepared to deal with this."*

Trigger events indicated by health service providers

Health service providers observed that poverty is one of the root causes of trauma since it has resulted in poor living conditions like hunger, lack of shelter and lack of income, making many people remember what the genocide took from them. They also further noted that most of the victims claim that there was injustice in Gacaca courts; hence some perpetrators are living freely in the communities.

Other trigger events cited by the health service providers also include the commemoration period itself through activities like testimonies, songs, and poems that bring back bad memories of what happened during the 1994 Genocide against Tutsi; insults, hurtful/insensitive words, and mocking by neighbors; diseases like HIV/AIDS brings depression and bad memories; scars and disabilities got from the genocide also brings back bad memories; attending burials of the dead reminds them of their loved ones that they did not get to bury; and loneliness most especially amongst the elderly and widows who have no one to take care of them when in trouble or sick are the biggest trigger events amongst trauma victims during the commemoration period and beyond.

Discussant No. VIII from Group 2, a 27-year-old lady, noted: *"One of the factors is seeing your*

tormentor being released without your knowledge. Survivors are sometimes surprised with the release of those who killed their relatives, this shocks them and contributes to their trauma crisis."

Reaction of neighbors as indicated by victims of trauma

From the discussions, victims noted that most of their neighbors are not supportive because they don't understand that one can have trauma. Some of the neighbors mock, insult, laugh at the victims, others get scared and flee away from the victims. These neighbors keep saying hurtful statements and falsely accuse the victims by saying that the symptoms demonstrated are staged, making the victims feel much stigmatized. Discussant M4 from Group 3 noted: *"Neighbors consider us to be mad. You will find them warning one another when the commemoration period is near-keep away from M4; her madness is now terrible. Instead of comforting us, they consider us mad; whenever they call us mad, our trauma worsens."* M4 further says that some neighbors have bad attitudes toward survivors. *"They graze their animals in the survivor's crops, and some of them remove our house doors."*

Although the majority of discussants indicated that their neighbors were not supportive, some indicated that their neighbors were very supportive and comforted victims, consoled them, talked to them, they helped change the environment of the victims by taking them to less noisy places, and some even took trauma victims for further help like counseling including seeking medical help.
"I got trauma during the holidays. I remember just finding myself at Masaka hospital, the person I was with did not know me, but he made a lot of sacrifices and took care of me and kept my things, and when we went back, he took me to his home saying I still haven't recovered energy, that I will go back after full recovery, after he organized my transport back to my home," V8 from Group 3.

The reaction of neighbors as indicated by family and friends of victims of trauma

All family members and friends are very supportive of the victims of trauma. Much as the trauma problems bring frustration to them because they cannot change history and time, they try to comfort victims, get closer to them, take them for counseling and call people with similar problems to share their experiences with their loved ones. Victims are given emotional support while others make them change the environment when traumatized. This is done by treating them as if they were in their shoes, listening to them, giving them touch therapy like hugging them, taking them to a less noisy environment, and comforting them.

However, when the family members/friends were asked about the neighbor's reaction towards a person in a trauma crisis, all discussants indicated that the neighbors don't support trauma victims since they insult them and falsely accuse victims of pretending to have trauma. The neighbors are not supportive because they don't understand that one can have trauma even after 24 years since the genocide against the Tutsi. They mock, insult, laugh at the victims, and others get scared and flee away from the victims. They keep saying hurtful statements and falsely accuse the victims by saying that the symptoms demonstrated are staged, making the victims feel more stigmatized.

"When there is a trauma incident, some neighbors flee the scene, even those you consider your friends run away from the victim. Most people in society think that trauma is meant for one group of society. Again, when neighbors see victims battling trauma, they will start gossiping, asking one another whether such a victim can be traumatized." Discussant F4 from Group 3 noted.

Challenges in victim's daily life indicated by victims of trauma

From the discussions, the biggest challenge highlighted for the trauma victims is the lack of support, insults and hurtful statements from the public, which makes them feel stigmatized. Other challenges include poverty, the lack of shelter, food, and other basic needs; inadequate service providers to handle the many trauma cases; lack of follow-ups of the trauma victims after the commemoration period; and lack of closure from the genocide perpetrators. Discussants also noted that there is a challenge of unprofessional service providers who don't ensure confidentiality of testimonies. Some also run away when they see a patient in crisis.

"Our daily lives are complicated. We have nowhere to get a living from. We only depend on support, and whenever we think about those who would be there for us, we feel shocked, and our head starts paining while our trauma stirs up. Again, we take medicines, which weaken us to the extent that we need something to eat and drink so as to regain energy, yet we are broke, and some of us receive no allowances. Only childless families are prioritized in giving allowances, with the rest of us being left aside." Noted Discussant M2 from Group 3.

Challenges indicated by family and friends of victims of trauma

Family and friends of trauma victims corroborated the challenges identified by the victims of trauma. These discussants indicated that poverty is the biggest challenge to the victims. This has led to poor living conditions like hunger, lack of shelter, and lack of income, and also increased trauma since the thought that they cannot have a good standard of living makes them remember how the genocide destroyed their property and took their loved ones. Other challenges mentioned include genocide ideology amongst community members, diseases like HIV/AIDS from sexual assaults during the genocide that victims have to deal with daily; and lack of health insurance preventing them from afford medical treatment in case of trauma crisis.

Challenges indicated by health service providers

Health service providers also indicated that poverty is the biggest challenge to trauma victims. This has led to poor living conditions, including hunger, lack of shelter, and lack of income. Other challenges raised by the health service providers include loneliness amongst the elderly and widows as a serious challenge; stigmatization and injustice have also made very many people feel unworthy of living in society; mistrust has left many people lonely and made them live in fear since they cannot trust anyone, and this has made them not to ask for help once traumatized. Health service providers also cited intermarriages and insults as posing the greatest challenge for victims in their everyday life since some of them are married to people from different ethnic groups. Most of these marriages have resulted in violence hence causing trauma.

Services received during the commemoration period that should be strengthened

There were a couple of suggestions of the services offered during the commemoration that should be strengthened in order to improve response to trauma cases. Discussants suggested an increment in a number of service providers to be able to attend to all the patients with trauma, especially during the commemoration period. Follow-ups of trauma victims to curb the trauma cases; training of service providers to improve their skills and so that the people can get professional and confidential help; need to use fellow survivors as service providers so that they can feel comfortable sharing with them since they believe that the fellow survivors will be able to understand them and help them better; and sensitization of the public about trauma to reduce on the stigmatization of the victims were some of the other services suggested to be improved.

New services to be introduced as indicated by victims of trauma

From the discussions, all 34 Discussants agreed that new services need to be added to improve the services offered to people experiencing trauma crises. The services that need to be added are; the need for support groups within different communities, and advocate for financial support for example service providers should work for free during commemoration so that people can be encouraged to seek help, and there should be an increment in FARG assistance, follow-ups after commemoration period, increase medical assistance in the health centers so that all the trauma patients are attended to, increased government support so that; justice is served in the Gacaca courts and support projects with people with trauma, need for confidentiality amongst the service providers, for example, Red Cross, need for moral support from both the government and the public, review of the Ubudehe categories, sensitization of the public about trauma, need more service providers and training service providers at village level to curb down on trauma.

New services indicated by family and friends of victims of trauma

Discussants advocated for more counselors since the number of counselors is few. They feel that if the number is increased, many people will be able

to get help. Furthermore, these counselors should be trained to get better skills when working with the victims as some break down when the victims are traumatized. Family and friends also advocated for more financial and material support from the government in order to improve their standards of living like building shelters, paying school fees, and starting up small businesses; more follow-ups in that the counselors should not only help them during commemoration period but also after the commemoration period; government intervention most especially to fight corruption in the Gacaca courts; there should be training programs for parents with children experiencing trauma so that the parents can be able to help their children.

Techniques used by health service providers to handle trauma victims

The results for the FGD show that service providers use counseling, which involves talking, listening, and advising the victims. They also lay victims in calm and secure places, and this is mainly done by keeping the victims away from the crowd, listening to him/her, helping them come back to normal life, providing basic needs like water, and checking vital signs in case there are any disease symptoms. Other service providers also monitor and counsel victims, and they keep records of their patients in order to see how they are coping with their services; while others use support groups, these groups are formed by people with similar problems so that they can share their testimonies and the solutions to their trauma.

Service providers also further indicated that they follow up with victims and give them appointments. This involves door-to-door visits and making sure the patient attends their appointments; they also give different treatments to victims, like medicine in order to reduce symptoms like headache and stomachache. Other providers use touch therapy, which involves massage and hugs; whereas others use exercises as a means of helping victims deal with trauma during commemoration.

Considerations for referring a trauma case to a higher service level

Service providers observed that a patient is referred to a higher service level when his/her health has deteriorated, for example, when an individual is in a coma or when there is no improvement after half an hour. Other patients are referred when there are disease symptoms that cannot be treated by the service provider's post. The referral also depends on the information got from the escort for example if the person has had chronic trauma and is very suicidal then they have to be referred to a higher service level. In addition, service providers indicated that referral also depends on the period spent when one has been traumatized, especially when a person is unresponsive to medicine and has failed to get better. Discussant PBA from Group 3 said: *"When their health keeps on deteriorating, we transfer them to the health center, especially when someone has fallen in a coma, or after an hour and a half has elapsed with no significant improvement."*

Prevention techniques to avoid relapse and new trauma cases and enhance a follow-up framework

There were a couple of prevention techniques that were suggested by the service providers in order to avoid relapse and enhance a follow up framework and they include the following; need for follow ups through giving appointments and visiting the patients at home to see how they are coping with life; training service providers so that they can professionally help the victims; recruiting service providers so as to increase on their number; sensitization of the public about trauma so as to reduce on stigmatization and enable those with trauma crisis to seek help from professionals; supervising service providers so as to make sure that they are providing a professional service; introducing a policy regarding trauma victims so as to also help them access services even after the commemoration period and conducting a census and close monitoring of the numbers of the trauma victims using a data base, which will help to see whether the techniques applied to curb down on the number of patients with trauma is reducing or not.

DISCUSSION

According to the Rwanda Ministry of Health, trauma-related crises are still a national public health concern, especially emotional crises and trauma cases identified during the commemoration period [10]. This study would help gain insights

into how the measures already in place tackling this problem might be performed according to victims, family and friends of victims, and care providers.

During the 1994 genocide against the Tutsi, more than 10% of the country's 7.8 million population and approximately 75% of the Tutsi were killed. This left many people widowed or orphaned [11]. Thus, some victims experience invisible trauma because most do not speak out for fear of being stigmatized. As highlighted by some discussants, some community members still consider survivors with trauma as mad people. "

Family members and friends of the trauma victims have observed increased trauma in their neighborhoods as a result of insults, the commemoration period itself, poverty, scars, diseases, and loneliness of survivors [12]. This also extends to young people born after genocide as they get traumatized even if they did not directly experience the killings. This is similar to what was reported in previous studies that the descendants of genocide survivors in Rwanda experience trauma symptoms [11]. It was found that descendants of genocide survivors with PTSD had more secondary trauma symptoms than descendants of parents without PTSD [11] and former prisoners (p < 0.0001) [11,13].

The service providers observed that trauma cases are still very complex, leading to other complexities like hypertension, diabetes, and cardiac diseases. Studies confirmed this and reported that 94% of people in Rwanda during the genocide experienced at least one genocide event, including witnessing the murder of family members, having their property and homes destroyed, and having their lives threatened [14]. These traumatizing events can contribute to several non-communicable diseases later in life [15,16], and trauma episodes also lead to stress, a risk factor for cardiovascular diseases and other chronic conditions [17,18].

These traumatic crises are quite contagious and can affect up to a hundred people at one commemoration site. For example, throughout the week of national mourning that ran from 7 to 13 April 2010, a total of 3193 people were reported to have developed these traumatic crises at different commemoration sites [6]. It has been established that attending the commemoration period may be a trigger of the crisis [6], in addition to other triggers reported by this study's participants. During seven days in April every year, Rwandans gather to mourn the victims of the genocide against Tutsis. Testimonies, songs, and documentary videos about the genocide are used to help people mourn by remembering their families and friends who perished during the genocide as a tool to build a violence-free country in the future and repair broken hearts. However, during these commemoration activities, survivors living with chronic PTSD manifest symptoms, such as flashbacks, agitation, self-mutilation, avoidance, anger, fear, crying, etc. [19]. Other symptoms are anxiety and bipolar disorder symptoms, uncoordinated statements, screaming, crying, hiding, running away, paranoia, depression, self-isolation, unconsciousness, hypertension, diabetes, headache, stomachache, and low self-esteem. A study conducted in Ngarama district hospital found that common mental health conditions were depression, anxiety, brief psychosis, drug (mainly cannabis) and alcohol misuse, and somatoform disorders [20].

This study revealed that some trauma victims' neighbors are not supportive of the trauma victims because of ignorance, and they falsely accuse victims of pretense. These add to other problems, like HIV/AIDS, stigmatization from within the community, poverty, lack of public support, inadequate service providers, lack of follow-ups, genocide ideology within the communities, and unprofessional service providers, worsening their symptoms [20]. However, previous interventions have focused primarily on the emergency period during the crisis. There has been inadequate follow-up intervention for individuals who experience repetitive crises during and after commemoration for those who do not regain their psychological health between crises and those who do not return for follow-up at health centers [9].

CONCLUSION

This study's findings highlight the need to increase the number of well-trained counselors and ensure follow-ups are undertaken to provide services to people at their doorsteps to curb trauma. To achieve this, the mental health authorities can engage fellow survivors and train them as counselors of their colleagues. The Ministry of health and its partners should introduce training programs for parents with children experiencing trauma so that they can easily be in a position to help their children when they get traumatized.

Support groups in different sectors should be emphasized and increased because through these, one can easily share their trauma with people who understand them, and solutions can easily be got. Through these groups, the communities can also be sensitized about trauma so as to stop the stigmatization.

Acknowledgements

REFERENCES

[1] J. Iyamuremye and R. White, 'Integrated Care Model Developed by the Rwanda Biomedical Center for Decentralization of Psychological Interventions during Commemoration of Genocide against Tutsi in Rwanda', RWJour, vol. 2, no. 1, p. 80, Oct. 2015, doi: 10.4314/rjhs.v2i1.11F.

[2] C. Musanabaganwa et al., 'Burden of post-traumatic stress disorder in postgenocide Rwandan population following exposure to 1994 genocide against the Tutsi: A meta-analysis', Journal of Affective Disorders, vol. 275, pp. 7–13, Oct. 2020, doi: 10.1016/j.jad.2020.06.017.

[3] N. Munyandamutsa, P. Mahoro Nkubamugisha, M. Gex-Fabry, and A. Eytan, 'Mental and physical health in Rwanda 14 years after the genocide', Soc Psychiatry Psychiatr Epidemiol, vol. 47, no. 11, pp. 1753–1761, Nov. 2012, doi: 10.1007/s00127-012-0494-9.

[4] R. Neugebauer, P. W. Fisher, J. B. Turner, S. Yamabe, J. A. Sarsfield, and T. Stehling-Ariza, 'Post-traumatic stress reactions among Rwandan children and adolescents in the early aftermath of genocide', International Journal of Epidemiology, vol. 38, no. 4, pp. 1033–1045, Aug. 2009, doi: 10.1093/ije/dyn375.

[5] S. Rudahindwa et al., 'Transgenerational effects of the genocide against the Tutsi in Rwanda: A post-traumatic stress disorder symptom domain analysis', AAS Open Res, vol. 1, p. 10, Apr. 2018, doi: 10.12688/aasopenres.12848.1.

[6] D. Gishoma, J.-L. Brackelaire, N. Munyandamutsa, J. Mujawayezu, A. A. Mohand, and Y. Kayiteshonga, 'Remembering and Re-Experiencing Trauma during Genocide Commemorations: The Effect of Supportive-Expressive Group Therapy in a Selected District Hospital in Rwanda', RWJour, vol. 2, no. 2, p. 46, Nov. 2015, doi: 10.4314/rj.v2i2.8F.

[7] Rwanda MOH, 'Rwanda's Performance in Addressing Social Determinants of Health and Intersectoral Action', Ministry of Health Rwanda, 2015. [Online]. Available: https://www.afro.who.int/publications/rwandas-performance-addressing-social-determinants-health-and-intersectoral-action

[8] Rwanda MOH, 'Health Service Packages for Public Health Facilities', Ministry of Health Rwanda, 2017. [Online]. Available: https://www.moh.gov.rw/fileadmin/user_upload/Moh/Publications/Legal_Framework/Public_health_Facilities_service_packages_in_Rwanda-1.pdf

[9] D. Gishoma, J.-L. Brackelaire, N. Munyandamutsa, J. Mujawayezu, A. A. Mohand, and Y. Kayiteshonga, 'Supportive-Expressive Group Therapy for People Experiencing Collective Traumatic Crisis During the Genocide Commemoration Period in Rwanda: Impact and Implications', J. Soc. Polit. Psych., vol. 2, no. 1, pp. 469–488, Aug. 2014, doi: 10.5964/jspp.v2i1.292.

[10] J. D. Kabakambira, G. Uwera, M. Hategeka, M. L. Kayitesi, C. K. Kalala Malu, and C. Hategeka, 'Burden of post-traumatic stress disorder acute exacerbations during the commemorations of the genocide against Tutsis in Rwanda: a cross-sectional study', Pan Afr Med J, vol. 30, 2018, doi: 10.11604/pamj.2018.30.216.15663.

[11] H. Rieder and T. Elbert, 'Rwanda – lasting imprints of a genocide: trauma, mental health and psychosocial conditions in survivors, former prisoners and their children', Confl Health, vol. 7,

no. 1, p. 6, Dec. 2013, doi: 10.1186/1752-1505-7-6.

[12] L. Rugema, 'Traumatic episodes related to the genocide period, mental health effects and perceived barriers to care facing young adults in Rwanda', University of Gothenburg, 2016. [Online]. Available: http://hdl.handle.net/2077/41554

[13] A. Shrira, B. Mollov, and C. Mudahogora, 'Complex PTSD and intergenerational transmission of distress and resilience among Tutsi genocide survivors and their offspring: A preliminary report', Psychiatry Research, vol. 271, pp. 121–123, Jan. 2019, doi: 10.1016/j.psychres.2018.11.040.

[14] P. N. Pham, H. M. Weinstein, and T. Longman, 'Trauma and PTSD Symptoms in Rwanda: Implications for Attitudes Toward Justice and Reconciliation', JAMA, vol. 292, no. 5, p. 602, Aug. 2004, doi: 10.1001/jama.292.5.602.

[15] C. J. O'Donnell et al., 'Posttraumatic Stress Disorder and Cardiovascular Disease: State of the Science, Knowledge Gaps, and Research Opportunities', JAMA Cardiol, vol. 6, no. 10, p. 1207, Oct. 2021, doi: 10.1001/jamacardio.2021.2530.

[16] J. D. Ford, D. J. Grasso, J. D. Elhai, and C. A. Courtois, Posttraumatic stress disorder: scientific and professional dimensions, Second edition. Amsterdam ; Boston: Elsevier/AP, Academic Press is an imprint of Elsevier, 2015.

[17] K. F. Alhabib et al., 'Demographic, behavioral, and cardiovascular disease risk factors in the Saudi population: results from the Prospective Urban Rural Epidemiology study (PURE-Saudi)', BMC Public Health, vol. 20, no. 1, p. 1213, Dec. 2020, doi: 10.1186/s12889-020-09298-w.

[18] K. Alhabib et al., 'Prevalence of cardiovascular disease risk factors and long-term outcomes in the Saudi population: Results from the Prospective Urban Rural Epidemiology study (PURE-Saudi)', In Review, preprint, Jan. 2020. doi: 10.21203/rs.2.21056/v1.

[19] Rakita, 'Lasting wounds:Consequences of Genocide and War for Rwanda's Children', Human Rights Watch Africa Division, Apr. 2003. [Online]. Available: https://www.hrw.org/report/2003/04/03/lasting-wounds/consequences-genocide-and-war-rwandas-children

[20] I. Palmer and N. Firmin, 'Mental health in post-genocide Rwanda', Int Psychiatry, vol. 8, no. 4, pp. 86–87, Nov. 2011.

Predictors of Survival of Preterm Newborns Admitted in Neonatology Unit at University the Teaching Hospital of Butare, Rwanda

Samson Habimana[1], Rosemary Okova[1], Dushimire Janvier[2], Jean Pierre Mivumbi[3]

[1]*Mount Kenya University, Kigali, Rwanda*
[2]*Kibungo Referral Hospital, Eastern Province, rwanda*
[3]*UUniversity Teaching Hospital of Butare, Huye, Rwanda*

ABSTRACT

*Corresponding author:
Dr. Samson Habimana
Mount Kenya University
Email: habimanasam115@
gmail.com

Introduction: Preterm delivery is a global challenge and we are still observing deaths from preterm newborns in developing counties including Rwanda. There is paucity of data about predictors of survival (defined as being discharged alive from the study hospital) of preterm newborns in Rwanda and no data available for referral hospitals.
This study was aimed to determine survival of preterm newborns and its predictors in neonatology unit of University Teaching Hospital, a referral hospital in Rwanda.

Methods: This was a cross-sectional study using quantitative methods. Data were collected during one-year period since July 2019 till June 2020, 401 participants have been admitted during the study period, and 17 participants have been excluded due to missing data. Data have been entered into excel, then imported into SPSS version 27. Descriptive statistics has been done by computing prevalence, binary and then multiple logistic regression has been used to assess the predictors of survival, the significance of predictors was reported with adjusted odd ratio and p value less than 0.05 was considered as statistically significant.

Results: Survival of preterm newborns was 96%. Gestational age and crying immediately at birth were significantly associated with survival of preterm newborns (p= 0.004). Crying immediately at birth were significantly associated with survival of preterm newborns (p= 0.001), and time to death (aHR: 0.09, 95% CI: 0.02-0.37, p<0.001). Number of antenatal care (ANC) visits significantly associated with time to death (aHR: 0.22, 95% CI: 0.06-0.78, p=0.02).

Conclusion: These findings show a high survival rate and identified gestational age, crying at birth, and ANC visits as the predictors of survival and time to death. Therefore, measures and strategies targeting these predictors, involving CHUB leadership and partners are recommended.

INTRODUCTION

Preterm birth, defined as the delivery of an infant before 37 completed weeks of gestation, is a significant public health concern worldwide [1]. Even though the preterm survival rate has improved in developed countries, neonates are still dying in developing countries as mostly result of inadequate maternal and newborn care [2]. The recent global estimate revealed that PTB counted

10.6% of global live birth in 2014, giving an estimate of 14.84 million preterm births globally. The figures show that the cases of preterm have been on an increase ever since 2000 up to 2014, whereby the Asia region only counted more than half (52.9%) of the global preterm birth proportion [2]. Evidence shows that 1 in 10 babies are born before the term [3]. PTB was ranged the first among the three top leading mortality causes in infants below the age of five (15.9%) in the estimate between 2000 – 2015 for 194 countries [4]. Globally, over 15 million newborns with an estimated 11% of all deliveries were recorded [5], and 1 million of them die annually, even those who survive face life-threatening disability as well as learning, visual and hearing problems. Yet, three quarters of deaths could be prevented through the current cost-effective care [6].

Developing countries are the most affected, 81.1% (12.0 million) happened in Asia and Sub-Saharan Africa in 2014 and five countries (India, China, Nigeria, and Indonesia) counted 44.6% of the global preterm birth babies in 2014 [2]. Prematurity occurs more in developing countries compared to developed countries 12% against 9% of babies are born before term [4].

Furthermore, [2], reported that in 2014 babies born in Africa represented 13.4% and 8.7% in Europe. The findings from the estimate from 194 countries between 2000 and 2015 showed that prematurity was classified as the number two main cause of infant death in Sub-Saharan Africa. Preterm birth counted 13% of death in children under five years. Three countries in Africa namely Nigeria, Ethiopia, and Tanzania were classified among the global top then countries with a high number of preterm birth in 2014 [2].

Survival of preterm babies varies considerably by geographic region and the level of income - whereby in low-income countries only less than 10% of preterm babies die. Again, for babies born at or less than 32 weeks in low-income countries, only a half of them survive resulting from lacking practicable, cost-effective essential care to preterm babies such as warming, support in breastfeeding, prevention and management of infection, and breathing support. Contrary similar babies born in high-income countries almost all of them survive [7]. While the rate of preterm birth was estimated to be 16.6% in Tanzania and 12% in Ethiopia [2], PTB in Rwanda is estimated to be 10% and roughly 35,000 preterm babies are born each year

[8], similar findings were reported by [9] in a survey carried out within Kigali and prevalence of preterm birth was 10.1%. Neonatal illnesses constitute the first cause of death in Rwanda, a total of 3,735 deaths were reported in 2016 from all health facilities and the ninth cause of morbidity in health centers [10]. The last Demographic and Health Survey (DHS) 2014/2015 reported neonatal mortality at 20 per 1000 live birth [11], the major cause of neonatal death is known to be a complication from PTB followed by intra and post-partum complication including birth asphyxia and infections. 90% of these deaths happen in the first 7 days of life [8]. Preterm birth is inferable to several risk factors including among others sociodemographic, environmental, obstetrical, fetal-neonatal, and newborn care. In the recently published systematic review by Laelago et al. [12] found lower age at childbirth, birth intervals, parity antenatal care (ANC) visit, gynecological infection and obstetrical complication to be associated with PTB in East Africa. Furthermore, survival or death of preterm babies is predicted by these factors along with fetal-neonatal factors and they have been reported by numerous researchers. Among them include practicing Kangaroo Mother Care, Mother serology status, and newborn breast breastfeeding [13]; sex of the new born, GA, place of delivery, presence of jaundice, and glycemic status anticipate the survival of preterm neonates [14]. The mortality due to preterm birth in Rwanda is still contributing a lot to neonatal mortality in general. it was reported the 2nd leading cause of death in 2019 in Rwanda [18]. Preterm and its complication compose the most portion of neonatal mortality whereby it is estimated that thirty five thousand of preterm babies are born every year, and 2,600 children die in Rwanda [8]. Therefore, this study aimed at determining the predictors of survival among the preterm newborn babies admitted at the University Teaching hospital of Butare (CHUB) neonatology unit from July 2019 to June 2020.

METHODS

Study Design: This study was a quantitative cross-sectional conducted from July 2019 to June 2020.
Study Site and Participants: The study was conducted in the neonatology unit of the University Teaching Hospital of Butare (CHUB) on preterm newborns born alive and admitted between July

2019 and June 2020 [total of 384 preterm newborns (GA<37 weeks) fulfilling inclusion criteria].

Data Collection: Data were extracted from the newborn personal medical file using a validated data collection sheet developed referencing to other similar published studies to ensure that it captured the maximum possible of the data elements to compute predictors of preterm birth survival [13–17]. The sheet was pilot-tested on 40 twenty-eight days old preterm birth newborns at Muhima Hospital to ensure consistency with the outcome of interest in this study. The finding from this pre-test were considered for the readjustments. The sheet has been used by the principal investigator and has recurrently checked the concordance of data entered in the sheet against the information recorded in the patient's file by another data collector (medical student) before moving to the next participant and a Cronbach alpha has been calculated at 0.74 (considered as acceptable).

Data Analysis: Descriptive statistics was performed, and data were presented in frequency and percentages. For assessing the predictors of preterm birth survival (defined as being discharged alive), regression analyses were conducted to identify assocaitions between socio-demographic characteristics, gynecologic and obstetric related data, preterm birth infant characteristics and the dependent variables. We calculated Hazard Ratios (HR) and their 95% confidence intervals (CI) to determine the associations between predictors and the newborn's mortality (death in hospital). Odds ratios (OR) and CI were calculated to determine survival predictors. Increased odds of death were interpreted as decreased odds of survival and vice versa. P-value was set at <0.05 for statistical significance

Ethical Considerations: The researcher got permission from Mount Kenya University authorities, from CHUB, as well as from Muhima Hospital ethical committee. Confidentiality, as well as anonymity, was insured during data collection and reporting of the results.

RESULTS

Among 384 study participants, mean age of mothers was 34.86 ± 2.33) and mean gestational age at birth was age 32.94 ± 5.69 weeks. The majority of participants (52.9%) were male (Table 1). Among all neonates 96% have survived until the end of hospital stay and 4% died during hospital

stay. In this study, the aim was to determine the survival of preterm newborns and 96% of preterm newborns survived till time of discharge from the neonatology department (Figure 1).

Table 1: *Demographic description of newborns*

Gender	Frequency	Percentage
Male	203	52.9
Female	181	47.1
Total	384	100
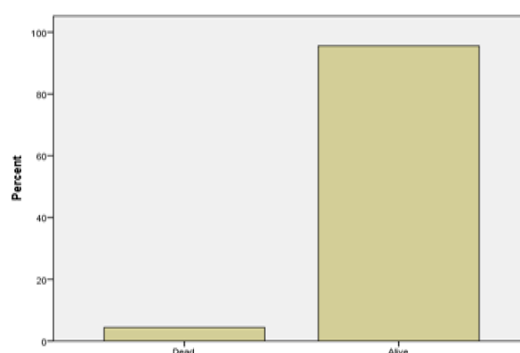
Figure 1: *Survival rate of preterm neonates*

Table 2: *Survival rate of preterm neonates*

Variables	Surviving newborns	Survival rate
Maternal age (in years)		
<25 29 (7.6%)	27	7.0%
25-29 63 (16.4%)	59	15.4%
30-34 143 (37.2)	138	35.9%
35-39 97 (25.3%)	94	24.5%
≥40 52 (13.5%)	51	13.3%
Antenatal care (ANC) visits		
<4 ANC 161 (41.9)	150	39.1%
≥4 ANC 223 (58.1%)	219	57.0%
Parity		
Primiparous 104 (27.1%)	92	24%
2-4 225 (64.4%)	248	64.8%
≥5 25 (6.5%)	28	7.30%

A high survival rate was among newborns with mothers of 30-34 years age group (survival rate of 35.9%), newborns with mothers having attended at least four antenatal visits (survival rate of 57.0%)

and newborns with multiparous mothers (survival rate of 34.8%) (Table 2).

There was a significant difference between the survival of newborns who cried immediately after birth and those who did not (p<0.001), with a higher survival among those who cried immediately after birth. The survival of newborns who did not cry immediately after birth tended to decrease with time (Figure 2).

Figure 2: *Kaplan Meier curve (by crying immediately after birth) of surviving preterm newborns (Log Rank (Mantel -Cox): chi _Square: 28.114 and p<0. 001)*

There is a significant difference in the survival rates of newborns depending on the GA (p<0. 001), with GA of 34 weeks and above being associated with the highest survival, followed by GA of 32-33.9 weeks (Figure 3). Among newborn characteristics, the number of ANC visits significantly associated with time to event (death) (aHR: 0.22, 95% CI: 0.06-0.78, P=0.02) (Table 3). Among maternal gynecologic and obstetric factors, crying imm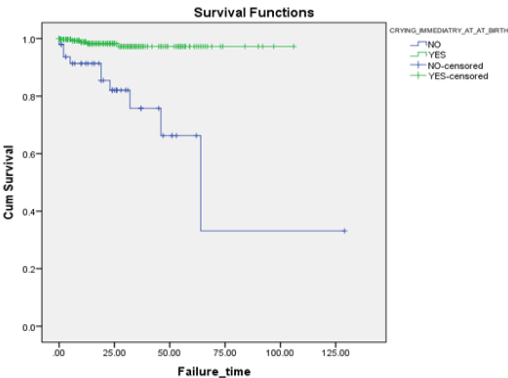ediately after birth significantly associated with time to death (aHR: 0.09, 95% CI: 0.02-0.37, P<0.001) (Table 4). Number of antenatal care (ANC) visits and parity were associated
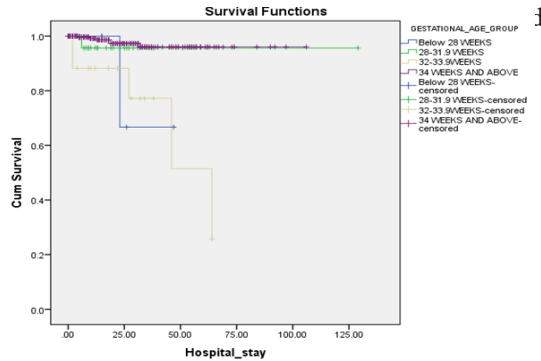
Figure 2: *Kaplan Meier curve (gestational age at birth) of surviving preterm newborns (Log Rank (Mantel -Cox): chi _Square:27.460 and p value<0.001)*

However, they were not significantly associated with survival on multiple logistic regression analysis.

Gestational age and crying of the baby have been found to be significantly associated with survival of preterm newborns (p=0.004 and p=0.001, respectively) in multivariate analysis (Table 6).

DISCUSSION

Preterm newborns face increased risks of mortality and morbidity due to their physiological immaturity. Identifying predictors of survival among preterm infants is crucial for optimizing neonatal care and improving outcomes. This study explored the predictors of survival among preterm newborns at the CHUB, and found that the survival of preterm newborns till time of discharge from the neonatology department was 96%. This survival rate is higher than the one found in Ethiopia (72.9%) [18,19], and the one previously reported in Rwinkwavu and Kirehe district hospitals (86.7%) [20].

Table 3: *Cox Regression table for Preterm newborn characteristics as predictors of time to event (death) of preterm newborns*

Preterm newborn characteristics	p-value	CHR	95% CI		p-value	aHR	95.0% CI	
			Lower	Upper			Lower	Upper
Age of mother at childbirth	0.221	0.728	4.38	1.21	0.577	0.851	0.482	1.503
Number of ANC visits	0.024	0.225	0.62	0.818	0.02	0.215	0.059	0.783
Parity	0.091	0.418	0.152	1.15	0.25	0.489	0.145	1.655

Statically significant; CHR: Crude Hazard ratio; aHR: Adjusted Hazard ratio; CI: Confidence Interval; ANC: antenatal care

Table 4: *Cox Regression table for newnatal predictors of time to event (death)of preterm newborns*

Newnatal factors	p-value	CHR	95% CI		p value	aHR	95.0% CI	
			Lower	Upper			Lower	Upper
Sex	0.275	0.536	0.165	1.642	0.299	0.54	0.169	1.727
Gestational age group	0.08	0.501	0.299	0.3	0.907	0.957	0.46	1.991
Birth weight group	0.194	0.525	0.198	1.388	0.839	0.871	0.23	3.298
Apgar_at_birth	0.035	0.28	0.086	0.915	0.465	0.613	0.165	2.278
pernatal_asphyxia_ diagnosed_at_birth	0.427	2.294	0.296	17.798	0.815	1.351	0.109	16.731
Hypoglycemia diagn0sed at admission	0.988	1.016	0.132	7.827	0.475	0.402	0.033	4.903
Jaundice	0.64	1.636	0.208	12.867	0.912	1.146	0.102	12.837
Neonate received CPAP	0.224	2.257	0.608	8.369	0.952	1.048	0.233	4.716
Crying immediately after birth	<0.001	0.82	0.025	0.268		0.093	0.024	0.356
Single liveborn infant delivered by cesarean delivery	0.327	1.194	0.196	16.198	0.115	0.151	0.009	15.631
Single liveborn infant born outside hospital	0.53	1.536	0.108	10.767	0.812	1.046	0.002	11.737
Suspected musculoskeletal condition	0.24	1.257	0.508	7.369	0.852	1.048	0.133	3.16

Crying immediately after birth was associated with a higher survival and longer time to death (p<0.001), and a higher gestational age was associated with a higher survival rate (p=0.004). These findings are similar to the ones found in studies conducted in similar settings at University Teaching Hospital of Kigali and Muhima hospital [21], as well as in Ethiopia, both at Mizan Tepi University Teaching Hospital [14] and at Gondar comprehensive specialized hospital neonatal intensive care unit, Northwest Ethiopia [22]. Crying immediately after birth is an important indicator of newborn vitality and respiratory function [23]. It helps clear fluid from the lungs and facilitates the expansion of alveoli, thus reducing the risk of respiratory distress [24]. Consequently, preterm infants who cry immediately after birth are more likely to have better outcomes and a higher likelihood of survival, while those who do not are more likely to have poor outcomes [25]. Prematurity severity increases with decreasing gestational age, and research shows that extremely preterm infants, born before 28 weeks of gestation, face significant challenges due to underdeveloped organ systems and are at a higher risk of mortality. Moreover,

moderately preterm infants, born between 32 and 37 weeks of gestation, have a better prognosis and higher survival rates [26,27]. Research showed that gestational age is associated with birthweight, which is another survival predictor in prematurity. Though it was not significantly associated with survival in our study, similar studies in Rwanda and other African countries showed that low birthweight was associated with high mortality [28–30]. Another study in Uganda showed that extreme preterm newborns had higher mortality rate than late preterm newborns [31]. Adequate prenatal care allows for early identification and management of risk factors associated with preterm birth, and provides an opportunity to monitor maternal conditions, identify signs of preterm labor, administer appropriate interventions, and offer education regarding preterm birth prevention [32] Mothers who receive timely and comprehensive antenatal care are more likely to have healthier pregnancies, reducing the risk of preterm birth and improving the survival chances of their newborns [32,33]. Aligning with other studies conducted in Rwanda, Ethiopia and Uganda [14,22,31, 33], our findings showed that the number antenatal

Table 5: *Maternal gynecologic and obstetric predictors of survival and survival in preterm newborns*

Variables		COR	[95% CI]	p-value	aOR	[95% CI]	p-value
Maternal age group (in years)				0.676			0.799
<25	29 (7.6%)	ref	-		ref	-	
25-29	63 (16.4%)		[0.16, 5.31]		2.92	[0.20, 42.69]	
30-34	143 (37.2)		[0.09, 2.65]		3.65	[0.23, 59.04]	
35-39	97 (25.3%)		[0.07, 2.71]		1.55	[0.07, 35.71]	
≥40	52 (13.5%)	0.26	[0.02, 3.05]		1.15	[0.03, 45.79]	
Number of antenatal care (ANC) visits				0.019			0.371
<4 ANC	161 (41.9)	ref	-		ref	-	
≥4ANC 223 (58.1%)		0.25	[0.08, 0.80]		0.50	[0.11, 2.26]	
Parity				0.024			0.297
Primiparous 104 (27.1%)		ref	-		ref	-	
2-4	225 (64.4%)	0.21	[0.07, 0.65]		0.29	[0.06, 1.55]	
≥5	25 (6.5%)	0.44	[0.05, 3.64]		0.80	[0.04, 14.54]	

care visits was associated with the time to death among preterm newborns, with a higher number being associated with longer time to death (aHR: 0.22, p=0.02). However, cumulatively, there was no significant association with the survival rate on multiple logistic regression. In contrast, research has indicated that women with no ANC visits were 3 times more likely to have low birthweight babies and their babies were 5 times likely to dies than babies of mothers with regular ANC visits [34].

The survival of preterm newborns till time of discharge from the neonatology department was 96%. This survival rate is higher than the one found in Ethiopia as well as in Cameroun (most likely) due to that fact that this study population was with less vulnerable (was with lesser fatal diseases and conditions) [17]. Gestational age and crying of the baby have been found to be significantly associated with survival of preterm newborns at p values of 0.004 and 0.001 respectively. This is due to the fact that, with increasing gestational

age, morbidity and morbidity of newbons decreases and this increases survival [19]. These findings are similar to the ones found in studies conducted in similar settings in Ethiopia, both at Mizan Tepi University Teaching Hospital [20] and at Gondar comprehensive specialized hospital neonatal intensive care unit, Northwest Ethiopia [17]. Being late preterm newborn is associated with survival, this is in line with similar studies in similar settings in Ghana where babies born with high birth weight survive longer than those with lower birthweight [21,22][23]. This is similar to findings in Uganda where extreme preterm newborns have higher mortality than late preterm newborns [24].

This study has some limitations, including lack of control of confounding factors, such as health system and hospital specific factors, associated with survival of preterm newborns. Due to the design of this study, advanced factors (genetic or biomarkers factors) were not considered in the

Table 6: *Newnatal predictors of survival in preterm neonates*

Variables	N (%)	COR	[95% CI]	p-value	aOR	[95% CI]	p-value
Preterm newborn characteristics							
Sex				0.314			0.763
Female	181 (47.1%)	ref	-		ref	-	
Male	203 (52.9%)	0.58	[0.20, 1.67]			[1.97-12.38]	
Gestational age (in weeks)				<0.001			0.004
<29	6 (1.6%)	ref	-		ref	-	
29-31	32 (8.3%)	6	[1.2,23]		0.523	[0.89,123,8]	
32-33	20 (5.2%)	5.00	[1.10, 22.82]		0.327	[0.54,61.2]	
≥34	326 (84.9)	0.22	[0.05, 0.91]		0.017	[1.8, 425.1]	
Birth weight (in grams)				0.225			0.608
<1,000	4 (1%)	ref	-		ref	-	
1000-1,499	56 (14.6%)	0.48	[0.15, 1.57]		1.66	[0.24, 11.44]	
>/=1,500	324 (84.4%)	0.333	[0.1,2.0]		1.44	[0.3-8]	
Crying at birth	333 (86.7%)			<0.001			0.001
No	51 (13.3%)	ref	-		ref	-	
Yes	333 (86.7%)	0.06	[0.02, 0.19]		0.08	[0.02, 0.37]	
APGAR at birth				0.015			0.214
Low APGAR	156(40.6)	ref	-		ref	-	
Good APGAR	228 (59.4)	0.24	[0.07, 0.75]		0.40	[0.10, 1.69]	
Hypoglycemia diagnosed at admission				0.895			0.528
No	30 (7.8%)	ref	-		ref	-	
Yes	354 (92.8%)	0.87	[0.11, 6.86]		0.41	[0.03, 6.42]	
Diagnosed with Jaundice				0.955			0.655
No	27 (7%)	ref	-		ref	-	
Yes	357 (93%)	0.94	[0.12, 7.45]		0.54	[0.03, 8.27]	
Diagnosed with perinatal asphyxia at birth				0.127			0.653
No	366 (95.3)	ref	-		ref	-	
Yes	18 (4.7)	3.39	[0.71, 16.33]		1.85	[0.13, 26.99]	
CPAP received				0.317			0.957
No	339 (88.3%)	ref	-		ref	-	
Yes	45 (11.7%)	1.95	[0.53, 7.18]		0.95	[0.15, 5.99]	
Z38.01 Single liveborn_ infant_delivered by cesarean				0.13			0.66

P<0.05: Statically significant; COR: Crude Odds Ratio; aOR: Adjugated Odds Ratio; CI: Confidence Interval; CPAP: Continuous Positive Airway Pressure; APGAR: Appearance, Pulse, Grimace, Activity, and Respiration

assessment of survival predictors.

CONCLUSION

This study showed a high survival rate among preterm newborns studied and survival and time to death predictors, including crying immediately after birth, gestational and antenatal visits. Understanding these predictors enhances clinical decision-making and facilitates targeted interventions to improve the survival rates and long-term outcomes of preterm infants. Therefore, we urge the leadership of CHUB and the ministry of health to establish and improve measures in place to target these identified factors to increase further the survival rate of preterm newborns. Neonatology staff should do their best to provide standard care focusing newborns with identified risk factors. Further studies should be conducted and extend to healthcare facilities that transfer to CHUB to provide information on preterm newborns' care.

REFERENCES

[1] T. B. Ayele and Y. A. Moyehodie, "Prevalence of preterm birth and associated factors among mothers who gave birth in public hospitals of east Gojjam zone, Ethiopia," BMC Pregnancy Childbirth, vol. 23, no. 1, p. 204, Mar. 2023, doi: 10.1186/s12884-023-05517-5.

[2] S. Chawanpaiboon et al., "Global, regional, and national estimates of levels of preterm birth in 2014: a systematic review and modelling analysis," The Lancet Global Health, vol. 7, no. 1, pp. e37–e46, Jan. 2018, doi: 10.1016/S2214-109X(18)30451-0.

[3] S. E. Purisch and C. Gyamfi-Bannerman, "Epidemiology of preterm birth," Seminars in Perinatology, vol. 41, no. 7. W.B. Saunders, pp. 387–391, Nov. 2017. doi: 10.1053/j.semperi.2017.07.009.

[4] L. Liu et al., "Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals," The Lancet, vol. 388, no. 10063, 2016, doi: 10.1016/S0140-6736(16)31593-8.

[5] M. S. Harrison and R. L. Goldenberg, "Global burden of prematurity," Seminars in Fetal and Neonatal Medicine, vol. 21, no. 2. W.B. Saunders Ltd, pp. 74–79, Apr. 2016. doi: 10.1016/j.siny.2015.12.007.

[6] World Health Organization, "Preterm birth Key facts," 2018.

[7] World Health Organization (WHO), "Preterm birth," 2018.

[8] Rwanda Ministry of health, "Maternal Newborn and Child Health Strategic Plan 2018-2014," 2018.

[9] E. Nsereko et al., "Maternal genitourinary infections and poor nutritional status increase risk of preterm birth in Gasabo District, Rwanda: A prospective, longitudinal, cohort study," BMC Pregnancy and Childbirth, vol. 20, no. 1, p. 345, Jun. 2020, doi: 10.1186/s12884-020-03037-0.

[10] National Institute of Statistics of Rwanda (NISR), Rwanda Statistical YearBook 2019. 2019.

[11] National Institute of Statistics of Rwanda, Rwanda Demographic and Health Survey, 2014-2015. 2015. doi: 10.1007/s13398-014-0173-7.2.

[12] T. Laelago, T. Yohannes, and G. Tsige, "Determinants of preterm birth among mothers who gave birth in East Africa: systematic review and meta-analysis," Ital J Pediatr, vol. 46, no. 1, p. 10, Jan. 2020, doi: 10.1186/s13052-020-0772-1.

[13] P. W. Charles Opio, Richard Malumba, Joseph Kagaayi, Olufemi Ajumobi, Carol Kamya, Aggrey Mukose, Yeka Adoke, Fiston Muneza, Angela Kisaakye, Christine Nalwadda, "Survival time and its predictors among preterms in the neonatal period post-discharge in Busoga region-Uganda June – July 2017," Journal of Interventional Epidemiology and Public Health. 2019;2:9, vol. Volume 2, no. Article 9, 26 Sep 2019, p. 2:9, 2019.

[14] A. E. Yismaw, A. A. Gelagay, and M. M. Sisay, "Survival and predictors among preterm neonates admitted at University of Gondar comprehensive specialized hospital neonatal intensive care unit, Northwest Ethiopia," Italian Journal of Pediatrics, vol. 45, no. 1, pp. 1–11, 2019, doi: 10.1186/s13052-018-0597-3.

[15] C. Opio et al., "Survival time and its predictors in preterm infants in the post-discharge neonatal period: a prospective cohort study in Busoga Region, Uganda," The Lancet Global Health, vol. 8, p. S6, Apr. 2020, doi: 10.1016/s2214-109x(20)30147-9.

[16] F. Ghorbani, M. Heidarzadeh, S. Dastgiri, M. Ghazi, and M. Rahkar Farshi, "Survival of Premature and Low Birth Weight Infants: A Multicenter, Prospective, Cohort Study in Iran," 2017.

[17] B. Minuye, "Preterm neonatal survival and predictors of their mortality among Preterm Neonates admitted in Debretabor General Hospital, Northwest part of Ethiopia," 31st EPHA Annual Conference, 2020.

[18] T. Tolossa et al., "Survival status and predictors of neonatal mortality among neonates admitted to Neonatal Intensive care Unit (NICU) of Wollega University referral hospital (WURH) and Nekemte Specialized hospital, Western Ethiopia: A prospective cohort study," PLoS ONE, vol. 17, no. 7, p. e0268744, Jul. 2022, doi: 10.1371/journal.pone.0268744.

[19] E. Abebaw, A. Reta, G. D. Kibret, and F. Wagnew, "Incidence and Predictors of Mortality among Preterm Neonates Admitted to the Neonatal Intensive Care Unit at Debre Markos Referral Hospital, Northwest Ethiopia," Ethiop J Health Sci, vol. 31, no. 5, pp. 937–946, Sep. 2021, doi: 10.4314/ejhs.v31i5.4.

[20] M. Nyishime et al., "A retrospective study of neonatal case management and outcomes in rural Rwanda post implementation of a national neonatal care package for sick and small infants," BMC Pediatr, vol. 18, no. 1, p. 353, Dec. 2018, doi: 10.1186/s12887-018-1334-1.

[21] A. Muhayimana, "Factors contributing to morbidity and mortality among preterm neonates admitted at two majorhospitals in Rwanda," Res. J. of Health Sci., vol. 5, no. 3, pp. 137–147, 2017.

[22] B. Bereka, T. Demeke, B. Fenta, and Y. Dagnaw, "Survival Status and Predictors of Mortality Among Preterm Neonates Admitted to Mizan Tepi University Teaching Hospital, South West Ethiopia," Pediatric Health Med Ther, vol. 12, pp. 439–449, 2021, doi: 10.2147/PHMT.S319774.

[23] A. Branco, M. Behlau, and M. I. Rehder, "The neonate cry after cesarean section and vaginal delivery during the first minutes of life," International Journal of Pediatric Otorhinolaryngology, vol. 69, no. 5, pp. 681–689, May 2005, doi: 10.1016/j.ijporl.2005.01.002.

[24] A. Kc et al., "Not Crying After Birth as a Predictor of Not Breathing," Pediatrics, vol. 145, no. 6, p. e20192719, Jun. 2020, doi: 10.1542/peds.2019-2719.

[25] A. Kc et al., "Impact of stimulation among non-crying neonates with intact cord versus clamped cord on birth outcomes: observation study," BMJ Paediatr Open, vol. 5, no. 1, p. e001207, 2021, doi: 10.1136/bmjpo-2021-001207.

[26] G. Gutvirtz, T. Wainstock, E. Sheiner, and G. Pariente, "Prematurity and Long-Term Respiratory Morbidity-What Is the Critical Gestational Age Threshold?," J Clin Med, vol. 11, no. 3, p. 751, Jan. 2022, doi: 10.3390/jcm11030751.

[27] J. Jin, A. Quinn et al., "Preterm birth: Case definition & guidelines for data collection, analysis, and presentation of immunisation safety data," Vaccine, vol. 34, no. 49, pp. 6047–6056, Dec. 2016, doi: 10.1016/j.vaccine.2016.03.045.

[28] F. Idris et al., Academic experiences, physical and mental health impact of COVID-19 pandemic on students and lecturers in health care education. BMC Med Educ, vol. 21, no. 1, p. 542, Dec. 2021, doi: 10.1186/s12909-021-02968-2.

[29] W. Khasawneh and W. Khriesat, "Assessment and comparison of mortality and short-term outcomes among premature infants before and after 32-week gestation: A cross-sectional analysis," Annals of Medicine and Surgery, vol. 60, pp. 44–49, Dec. 2020, doi: 10.1016/j.amsu.2020.10.017.

[30] N. Gupta et al., "Causes of death and predictors of childhood mortality in Rwanda: a matched case-control study using verbal social autopsy," BMC Public Health, vol. 18, no. 1, p. 1378, Dec. 2018, doi: 10.1186/s12889-018-6282-z.

[31] W. I. Egesa et al., "Preterm Neonatal Mortality and Its Determinants at a Tertiary Hospital in Western Uganda: A Prospective Cohort Study," PHMT, vol. Volume 11, pp. 409–420, Oct. 2020, doi: 10.2147/PHMT.S266675.

[32] J. Requejo, M. Merialdi, F. Althabe, M. Keller, J. Katz, and R. Menon, "Born Too Soon: Care during pregnancy and childbirth to reduce preterm deliveries and improve health outcomes of the preterm baby," Reprod Health, vol. 10, no. S1, p. S4, Nov. 2013, doi: 10.1186/1742-4755-10-S1-S4.

[33] C. N. Schmidt, E. Butrick, S. Musange, N. Mulindahabi, and D. Walker, "Towards stronger antenatal care: Understanding predictors of late presentation to antenatal services and implications for obstetric risk management in Rwanda," PLoS ONE, vol. 16, no. 8, p. e0256415, Aug. 2021, doi: 10.1371/journal.pone.0256415.

[34] T. Tolossa, G. Fekadu, B. Mengist, D. Mulisa, G. Fetensa, and D. Bekele, "Impact of antenatal care on neonatal mortality among neonates in Ethiopia: a systematic review and meta-analysis," Arch Public Health, vol. 78, no. 1, p. 114, Dec. 2020, doi: 10.1186/s13690-020-00499-8.

A Community-Based Study on the Knowledge and Practices towards COVID-19 Prevention in Binunga Village of Rwanda

Bushaija Emmy[1], Wabwire Paul Francis[1], Okesina Akeem Ayodeji[1,*], Habyarimana Innocent[1]

[1]College of Medicine and Health Sciences, University of Rwanda.

*Corresponding author:
Dr Okesina Akeem Ayodeji
College of Medicine and Health
Sciences, University of
Rwanda.
E:mail: akeemokesina@gmail.
com

ABSTRACT

Introduction: Background: COVID-19 has become the fifth documented pandemic since 1918, threatening to widen inequalities globally. Binunga village recorded an increase in COVID-19 cases, which was attributed to the limited community knowledge and practices of COVID-19. Therefore, the need to ascertain knowledge and practices in Binunga village on COVID-19 preventive measures during the pandemic.

Methods: A descriptive cross-sectional study was utilized. Simple random sampling was used to select 198 respondents for data collection using face-to-face interviews.

Results: In this study, all 198 respondents (100%) demonstrated awareness of COVID-19. A significant proportion of respondents, 90.4%, 95.5%, and 99%, respectively, possessed knowledge of the causes, associated risk factors, and the potential for COVID-19 to be cured. Moreover, 80.3% and 68.7% of the respondents were aware of the main modes of transmission and recognized the symptoms of COVID-19. Interestingly, a majority of respondents (64%) were unaware of self-isolation measures, while 21% demonstrated awareness, and 15% correctly stated a duration of 14 days for isolation accompanied by symptom monitoring. In terms of preventive measures, all respondents (100%) reported wearing face masks, 98% engaged in hand washing, 46.5% practiced social distancing, and 6.6% made necessary movements. Additionally, 95.5% of respondents reported being vaccinated, while 27.8% observed self-isolation in the presence of COVID-19 symptoms, and 72.2% sought treatment.

Conclusion: The residents of Binunga exhibited commendable knowledge of COVID-19 and preventive measures, emphasizing effective public health communication and the need for targeted interventions to address remaining knowledge gaps.

INTRODUCTION

Since the emergence of the Coronavirus disease (COVID-19) outbreak in Wuhan, Hubei, China, in November 2019, there have been substantial global implications for public health [1]. In response, efforts have been directed towards raising awareness and implementing health communication strategies to promote knowledge of COVID-19 prevention [2]–[4], and to raise community knowledge of healthy practices against COVID-19 prevention [5]. It is well recognized that individuals' practices are often influenced by their level of knowledge [6]. The COVID-19

pandemic, caused by the SARV-CoV-2 virus, originated in Wuhan City, China, in late December 2019 and rapidly spread worldwide [7]. As of June 2022, there were over 533 million confirmed cases and approximately 6.3 million deaths globally [8]. Notably, the United States of America (USA) reported the highest number of confirmed cases (around 85 million) and over 1 million deaths. In Africa, South Africa had the highest number of cases (over 3.97 million) and 102,873 deaths, while Kenya recorded the highest number of cases (328,977) and 5,651 deaths in the East African region [8]. Ten months after its initial case, Rwanda reported 10,316 cases and 133 COVID-19-related deaths, resulting in a case fatality rate (CFR) of 1.3%. This relatively low CFR in Rwanda raised questions regarding the factors contributing to its success in managing the pandemic [9]. However, by June 2021, the number of confirmed cases in Rwanda had risen to 30,813, with 382 deaths. Within a month, in July 2021, an additional 18,203 cases and 200 deaths were reported [10].

COVID-19 symptoms include fever, difficulty in breathing, tiredness, muscle aches and pain, and dry cough [11]. All people are at risk of infection but the most vulnerable people include those with comorbidities such as diabetes, HIV/AIDS, and hypertension; and either the advanced age (above 65 years) or the young below 5 years old. There is no curative treatment but supportive treatment, and the use of vaccines is now available [11]. According to current evidence, COVID-19 is transmitted between people through respiratory droplets, fomites, and direct contact routes [12]. The World Health Organization (WHO) has proven preventive measures to deal with the pandemic, including but not limited to regular handwashing using soap and clean water or the use of sanitizers to avoid contamination, avoidance of touching eyes, mouth, nose, and handshakes, to cover the mouth and nose by wearing a facial mask, avoidance of unnecessary movement and social distancing [11].

Rwandan Government inaugurated a joint task force headed by the prime minister, which organized a weekly public awareness on preparedness and response plan for the pandemic. This was done at the peak of the pandemic by mid-July 2020 to create awareness among the population and to reduce the spread of COVID-19 [2]. There were also different means of community sensitization and measures taken in the form of air travel bans, closure of all borders, suspension of public transportation, limitations of unnecessary movements, the closing of public spaces such as schools and churches, isolation, and care for COVID-19 infected patients and/ or suspected cases [7]. Initially, a national lockdown, self-quarantine campaign was launched and led by Rwanda National Police- requiring people to stay and work from home from March 20, 2020.

Subsequently, Rapid Response Teams (RRTs) were activated at central and district levels to respond to the pandemic in collaboration with local leaders and government organs focused on the prevention of the spread of COVID-19 [7], [13]. Despite the efforts in place, daily data from Rwandan Biomedical Center (RBC) showed that the pandemic was spreading in all districts of Rwanda, and the number of positive cases was rising [7].

The Village of Binunga, Murama cell in Kinyinya sector-Gasabo district, Kigali, Rwanda, had a large number of positive cases of COVID-19 where new cases increased from around 30 to 60 confirmed cases within a period of 14 days (late June and early July 2021), compared to the number of cases in the month of May [7]. The high number of positive COVID-19 cases in Binunga village indicates a significant lack of community knowledge and poor practices regarding disease prevention. Insufficient awareness about COVID-19 and inadequate adherence to preventive measures such as handwashing and wearing face masks contribute to the spread of the virus. It is crucial to promote and prioritize good health knowledge, positive attitudes, and appropriate practices in disease prevention to effectively control and mitigate the impact of pandemic diseases [7]. A recent study in Rwanda among health workers in April 2020 found that all (100%) understood COVID-19 transmission and prevention as well as the necessity for self-isolation and quarantine as control measures. Subsequently, 95% of the population of Rwanda, was reported to be mainly engaged in hand washing; social distancing; limiting unnecessary travel and crowds as well as using facial masks and gloves [7].

This study aims to investigate the knowledge and practices of the semi-urban community in Binunga village, Kinyinya sector, Kigali City, regarding COVID-19 prevention. The findings of this study are expected to provide valuable insights to healthcare providers, local leaders,

and other stakeholders regarding the community's understanding and behavior toward COVID-19 prevention measures. By conducting this community-based study, researchers and public health professionals will be able to gather important information that can guide efforts in promoting accurate knowledge, addressing misconceptions, and enhancing preventive practices specifically within the Binunga Village community in Rwanda.

METHODS

Study Design and Sample Technique
The study was a cross-sectional study, and quantitative data were collected from household members that were aged over 18 years. The sample size (n) was determined using Taro Yamane's method [14], and out of 392 households, gave 198 respondents.

n= N/[1+N(e^2)] ; where: n is the sample size; N is the total study population and e is the margin error. Since Binunga village is composed of 392 resident households (Data from the Head of Binunga village, 2021), N=392 and e=0.05

Then, n= 392/[1+392(0.05^2)] = 198 respondents.

Simple random sampling was used for data collection, where households with adult members were picked randomly using the lottery method without replacement until the desired number of respondents was obtained.

Study Tool
For data collection, a structured questionnaire was developed as the study tool, and face-to-face interviews were conducted. The questionnaire consisted of three sections. Section A included seven questions to gather information on the participants' socio-demographic characteristics. Section B comprised ten questions to assess participants' knowledge of COVID-19 prevention, while section C comprised six questions about their practices in preventing COVID-19. To ensure quality control, expert opinions from researchers and statisticians were sought to validate the content and design of the research tool. The questionnaire underwent a pre-testing phase in a non-study area, and feedback was incorporated into the final version, which was produced in the Kinyarwanda language. The use of neutral language and open-ended questions helped minimize bias in the questionnaire. The pre-coded data was checked and entered in SPSS version 21. The accuracy of the data entered was further checked and cleaned through trial runs; i.e., the data were doubled checked by the research assistants. Data analysis was done where knowledge and practices were determined by the number of scores of the questions that were obtained. Then, knowledge variables were dichotomized into right or wrong responses, and the right answer was assigned one mark. The sum of marks of every respondent was scored out of 10, then total marks were classified into low (0-3), average (4-6), and high (7-10). Likewise, the score for practice was categorized as poor (0-2), fair (3-4), and good (5-6) as the total questions for practice are 6 [15].

Ethical Considerations
Upon the approval of the research proposal by the College of Medicine and Health Sciences (CMHS)-School of Health Sciences, the Institutional Review Board (IRB) of the College of Medicine and Health Sciences at the University of Rwanda granted ethical clearance (CMHS/ IRB/235/2022). Subsequently, permission for data collection was obtained from the relevant authority in Kinyinya Sector. Prior to the commencement of data collection, the study participants received comprehensive orientation and were fully informed about the study's objectives and procedures. They were given the autonomy to choose whether to participate or withdraw from the study, and confidentiality was ensured by not collecting any personal identifying information. The participants were informed that the study was solely for educational purposes, which encouraged their participation.

RESULTS

The Socio-Demographic Characteristics of Respondents
The youngest respondent was 19 years old, and the oldest was 67 years. The majority of respondents (59.1%) were in the 18-29 years age group. Approximately 65.2% of the respondents were females while 34.8% were males. Though most of the participants were married 51% and single 31.3%, some were divorced, separated, or widowed. Educational level varied where the respondents attained secondary schools and primary schools were equal (48.5% each) while 0.5% attended university schools and 2% had no formal education.

Table 1: *Socio-Demographic Characteristics of Respondents*

Socio-demographic factors		Frequency	Percentages
Age group	18-29	117	59.1%
	30-39	59	29.8%
	40 and above	22	11.1%
Gender	Male	69	34.8%
	Female	129	65.2%
Marital status	Single	62	31.2%
	Married	101	51.0%
	Divorced	11	5.6%
	Widowed	12	6.1%
	Separated	12	6.1%
	None	4	2.0%
	Primary	96	48.5%
Education level	Secondary	96	48.5%
	University	1	0.5%
	Missing value	1*	0.5%
	Farmer	124	62.6%
	Trader	38	19.2%
	Others	33	16.7%
Occupation	Unemployed	3	1.5%
Ubudehe category	Category 1	10	5.1%
	Category 2	94	47.5%
	Category 3	94	47.5%
	Catholic	68	34.3%
Religion	Protestant	106	53.5%
	Adventist	16	8.1%
	Muslim	2	1.0%
	Others	6	3.0%

The largest proportion (47.5%) of respondents were classified in Ubudehe category B equalized by Category C and Category A (5.1%). The occupation of the participants also varied where many of them were farmers (62.9%), 19.2% were traders, 16.7% had other occupations, and 1.5 had no employment. The largest portion was protestants (53.5%) followed by catholic (34.3%). Table 1 shows further details on socio-demographic characteristics.

Regarding knowledge of the respondents about actions taken by people upon contact with a confirmed case of COVID-19, 64% did not know, while 21% knew that the people are isolated for 14 days without symptoms monitoring, and 15% stated that they are put in 14 days isolation with symptoms monitoring, as presented in Figure 1.
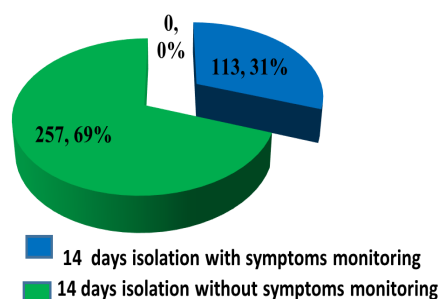

Figure 1: *Respondents' knowledge on action taken upon contact with a confirmed case of COVID-19*
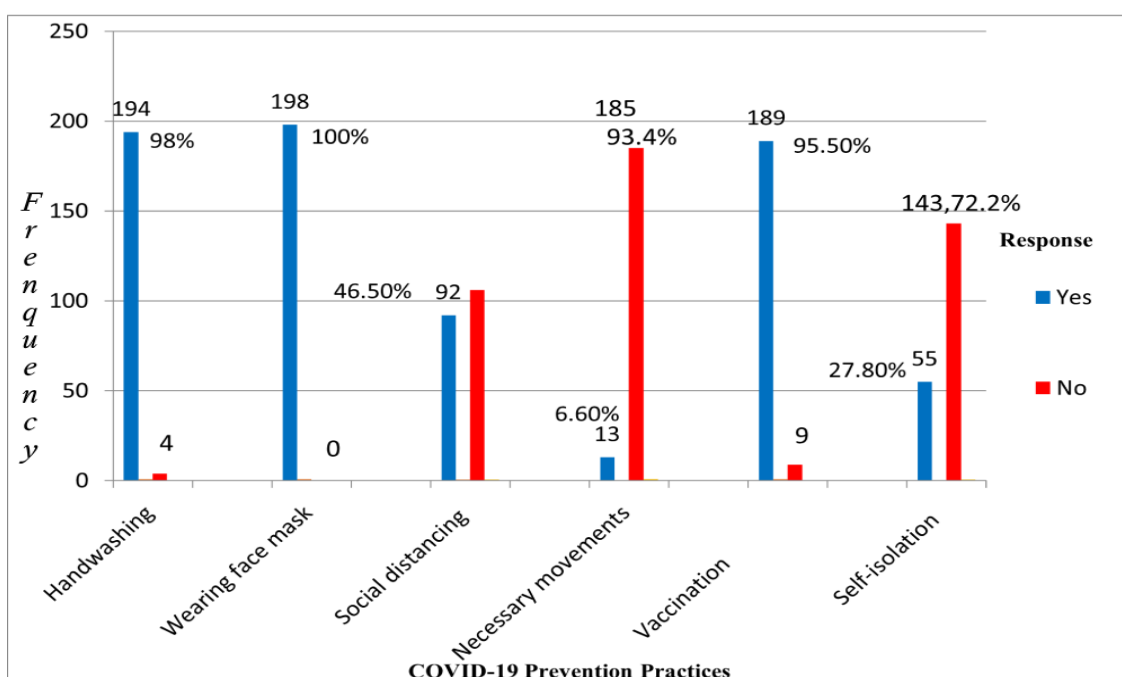
Figure 2: *Practices of the respondents about COVID-19 prevention*

Practices of Respondents on Covid-19 Prevention

The respondents were also asked about their practices regarding COVID-19 preventive measures such as hand washing and wearing face masks (Figure 2). The majority of the respondents 98% (194) frequently washed their hands with clean water and soap or used sanitizers, and all the respondents (100%) wore face masks before going outside their homes, while 46.5% of the respondents observed social distancing in public places and only 6.6% of respondents made necessary movements out of their homes. Almost all the respondents (95.5%) got at least 1 dose of the COVID-19 vaccine, 27.8% observed self-isolation with symptoms of COVID-19, while

Table 3: *Successful notification and multiple partner listing by sex and marital status of index clients*

Knowledge items	Response	Frequency	Percentage (%)
Have heard about COVID-19	Yes	198	100
	NO	0	0
Knows about COVID-19	Yes	179	90.4
	NO	19	9.6
Understands COVID-19 prevention measures	Yes	198	100
	No	0	0
Thinks COVID-19 is curable	Yes	196	99
	No	2	1
Knows that COVID-19 Vaccines are available	Yes	198	100
	No	0	0
Knows main modes of transmission COVID-19	Yes	159	80.3
	No	39	19.7
Recognizes symptoms of COVID-19	Yes	136	68.7
	No	62	31.3
Knows more than 4 main risk factors of COVID-19	Yes	189	95.5
	NO	19	4.5

72.2% (143) went directly to the health facility or Community Health Workers.

The knowledge of 198 respondents about COVID-19 prevention was assessed by asking questions on; general knowledge, causative agent, preventive measures, whether it is curable, availability of
vaccines, mode of transmission, recognizable symptoms, and associated risk factors (Table 2).
All respondents 100% had heard of COVID-19, knew that it could be prevented, and were aware of the existence of vaccines. Respectively, 90.4%, 95.5%, and 99% of the respondents know; about the causes and more than four associated risk factors of COVID-19 and think COVID-19 can be cured. Also, table 2 shows that 80.3% and 68.7% of the respondents know the main modes of transmission and recognize symptoms of COVID-19, respectively.

Table 3: *Comparing Knowledge and Practices in COVID-19 Prevention*

Category	Knowledge, n (%)	Practices, n (%)
Highly knowledgeable	198 (100)	6 (3)
Fair knowledge	0	189 (95.5)
Poor knowledge	0	3 (1.5)

Overall Knowledge and Practices on COVID-19 Prevention
All the respondents (100%) were highly knowledgeable about COVID-19 prevention, while 3% had good practices, 95.5% had fair practices and only 1.5% had poor practices (Table 3).

DISCUSSION

This study showed that the people in the Binunga community were knowledgeable (100%) about
COVID-19, although the practices regarding self-isolation and social distance were poorly implemented. The study found that the majority of 90.4% knew the virus as the causative agent of Covid-19 and concurred with a study done in the Ivory Coast; out of 580 respondents, 90.6% knew that the causative agent of COVID-19 [16]. Furthermore, it was found that 68.7% of respondents knew that cough, fever, fatigue, and shortness of breath are the main symptoms of Covid-19, and 80.3% stated that droplets, fomites,

and direct contact with infected people are modes of transmission of COVID-19. This concurs with a study in Malawi where 62% knew that fever, dry cough, fatigue, and shortness of breath are the main symptoms of COVID-19 [17,18] and 76% stated that direct contact with infected people, droplets of infected people, and touching the surface of items infected by the virus is the main mode of transmission of COVID-19 [19]. This high knowledge of symptoms and modes of transmission of COVID-19 is due to the fact that in their community, such as markets, car parks, and trading centers were posters showing the symptoms of COVID-19 and everyday mass media messages about disease transmission and prevention. It was also found that the main source of COVID-19 information was from the community, friends, and health workers (98.3%) [7], and throughout the course of the pandemic, community health workers (CHWs) and youth volunteers were tasked to disseminate educative messages about COVID-19 [7].
The majority of respondents (95.5%) knew more than four main risk factors of COVID-19, notably advanced age and being young and having comorbidity. The finding is similar to a study in Saudi Arabia, where 92.2% showed that these groups had more risk of getting COVID-19 than other people [20]. Again, this study shows the importance of various health communications that address the mode of transmission.
The results of this study highlight a concerning issue regarding self-quarantine practices among the respondents. Only 64% of the participants were aware of the recommended 14-day isolation period after being in contact with a confirmed case of COVID-19. This suggests a lack of widespread understanding and adherence to this important preventive measure. Additionally, 21% of the respondents knew about the 14-day isolation period without symptoms monitoring, while 15% mentioned the need for isolation with symptoms monitoring. These findings indicate a potential problem with self-quarantine practices in the studied population. Despite efforts to control the spread of the pandemic in Rwanda, the researcher noted that the virus was still spreading across all districts, and the number of positive cases continued to rise. The low awareness and inconsistent understanding of self-quarantine measures observed in this study could contribute to the ongoing transmission of the virus. Addressing this issue requires targeted interventions and

educational campaigns to increase awareness and promote proper self-quarantine practices. Public health authorities in Rwanda may need to enhance communication strategies to ensure that individuals understand the importance of isolating themselves for the recommended duration, regardless of symptoms present, and actively monitor their health during this period. By improving adherence to self-quarantine measures, it is possible to reduce the transmission of COVID-19 and mitigate the rising number of positive cases in the country [7]. Regarding practices of respondents about COVID-19 prevention, the study showed that 98% of respondents frequently washed their hands with clean water and soap or sanitizers, and 100% wore face masks before going outside their houses. This finding is similar to a study done in China where of 170 respondents, 97.6% reported wearing face masks when going out in public places [21]. However, this contrasts with a study conducted in the Ivory Coast, where 51.2% of respondents washed their hands, and 48.9% wore their face masks in public [7]. Furthermore, this study revealed that 6.6% of the respondents made unnecessary movements, and 46.5% practiced social distancing while in public places. This is similar to findings in a study done in Malawi, where only 9% of respondents avoided unnecessary movements, and 33% practiced social distancing in public places [19]. This suggests a significant amount of respondents restricted their movements during the pandemic; less than half of the respondents adhered to the rules of social distancing.

Lastly, based on the information provided, there is a notable disparity between the knowledge and practices regarding COVID-19 prevention among the respondents. The data indicates that all respondents (100%) had a high knowledge of COVID-19 prevention. This suggests that they were well-informed about the preventive measures, such as wearing masks, practicing hand hygiene, and maintaining social distancing [22]. However, when it comes to translating that knowledge into practice, the numbers reveal a different picture. Only a small proportion of respondents (3%) demonstrated effective practices in implementing the preventive measures. This implies that despite being knowledgeable, a limited number of participants consistently followed the recommended preventive measures.

The majority of respondents (95.5%) were

categorized as having fair practices. This indicates that they may have some level of adherence to preventive measures but might not consistently follow them or may have room for improvement in certain aspects. It is concerning to note that a small percentage of respondents (1.5%,) exhibited poor practices. This suggests that despite having the necessary knowledge, these individuals did not effectively implement preventive measures, potentially putting themselves and others at risk [23]. The comparison between knowledge and practices highlights the need for bridging the gap between awareness and action. It underscores the importance of not only providing education and knowledge about COVID-19 prevention but also promoting and supporting behavior change to ensure consistent and effective implementation of preventive measures.

The study used a cross-sectional design and was conducted in a single village, and as practices were not observed, the results cannot be used as a representation of the whole country of Rwanda. Nevertheless, the study has shed light on the importance of health communication in communicable disease prevention and control, specifically COVID-19.

We did not look at the attitude and perception in the study because we tried to reduce the number of inflated responses from the respondents.

CONCLUSION

The findings of this study indicate that a significant proportion of residents in Binunga village are well-informed about various aspects of COVID-19, including its causes, preventive measures, available treatments, vaccine availability, modes of transmission, associated symptoms, and key risk factors. Moreover, the majority of residents actively practiced important preventive measures such as handwashing, mask-wearing, and vaccination. However, there is a need for increased adherence to social distancing measures and improved self-isolation practices when in contact with confirmed cases. Therefore, the study reveals that a substantial number of Binunga village residents know about COVID-19 and its preventive measures.

The Government Task Force on COVID-19 and Health Workers stationed in Binunga village should understand the reason behind the low

adherence to self-isolation after being in contact with a confirmed case of COVID-19.

Also, there is a need for the involvement of youth volunteers, health professionals, civil servants, religious leaders, etc., to keep engaging the community in practicing COVID-19 preventive measures. However, further research is needed to identify perceptions and attitudes associated with COVID-19.

Efforts should focus on designing interventions that target behavior change, address barriers to practice, and promote the adoption of good practices among the population. This could involve targeted awareness campaigns, community engagement, and ongoing support to reinforce positive behaviors.

REFERENCES

[1] J. Sun et al., "COVID-19: Epidemiology, Evolution, and Cross-Disciplinary Perspectives," Trends Mol. Med., vol. 26, no. 5, pp. 483–495, 2020, doi: 10.1016/j.molmed.2020.02.008.

[2] H. T. Le et al., "Factors Associated with Community Awareness on COVID-19 in a Developing Country: Implications for Optimal Risk Communication," Risk Manag. Healthc. Policy, vol. 15, no. February, pp. 415–426, 2022, doi: 10.2147/RMHP.S356690.

[3] S. Umakanthan, A. Chauhan, M. M. Gupta, P. K. Sahu, M. M. Bukelo, and V. K. Chattu, "COVID-19 pandemic containment in the Caribbean Region: A review of case-management and public health strategies," AIMS Public Heal., vol. 8, no. 4, pp. 665–681, 2021, doi: 10.3934/publichealth.2021053.

[4] M. R. Azizi, R. Atlasi, A. Ziapour, J. Abbas, and R. Naemi, "Innovative human resource management strategies during the COVID-19 pandemic: A systematic narrative review approach," Heliyon, vol. 7, no. 6, p. e07233, 2021, doi: 10.1016/j.heliyon.2021.e07233.

[5] M. Vivalya et al., "Lockdown, social distancing and mental health during the covid-19 pandemic in African settings: The people perspectives, challenges, and opportunities in Democratic Republic of Congo (Preprint)," JMIR Public Heal. Surveill., no. 1000002, pp. 19–21, 2020, doi: 10.2196/20785.

[6] Y. Li, G. Liu, R. O. Egolet, R. Yang, Y. Huang, and Z. Zheng, "Knowledge, Attitudes, and Practices Related to COVID-19 Among Malawi Adults: A Community-Based Survey.," Int. J. Environ. Res. Public Health, vol. 18, no. 8, 2021, doi: 10.3390/ijerph18084090.

[7] N. Pacifique, N. E. ,*, Nkeshimana Menelas, Hitimana Nadia, Turatsinze David, Y. K. Byiringiro Fidele, Habinshuti Mike, Nyamusore Jose, Nyamwasa Daniel, and N. S. Mutesa Leon, "No TitleKnowledge, attitudes and preventive practices towards COVID-19 among frontline healthcare workers in Rwanda," Rw. Public Heal. Bul., vol. 2, no. 1, pp. 16–21, 2020.

[8] WHO, "World health Organization. COVID-19 Weekly Epidemiological Update 47," World Heal Organ. world health organization, pp. 1–18, 2021.

[9] C. Musanabaganwa et al., "One hundred thirty-Three observed COVID-19 deaths in 10 months: Unpacking lower than predicted mortality in Rwanda," BMJ Glob. Heal., vol. 6, no. 2, pp. 1–6, 2021, doi: 10.1136/bmjgh-2020-004547.

[10] WHO, "COVID-19 weekly epidemiological update.," World Heal Organ. world health organization, pp. 1–23, 2022.

[11] N. Twinamasiko, R. Olum, A. M. Gwokyalya, I. Nakityo, E. Wasswa, and E. Sserunjogi, "Assessing Knowledge, Attitudes and Practices Towards COVID-19 Public Health Preventive Measures Among Patients at Mulago National Referral Hospital," Risk Manag. Healthc. Policy, vol. Volume 14, pp. 221–230, Jan. 2021, doi: 10.2147/RMHP.S287379.

[12] R. GÜNER, İ. HASANOĞLU, and F. AKTAŞ, "COVID-19: Prevention and control measures in community," TURKISH J. Med. Sci., vol. 50, no. SI-1, pp. 571–577, Apr. 2020, doi: 10.3906/sag-2004-146.

[13] J. M. et al. B Mutume- N Vivalya, Okesina A A, Mutuka H, Muyisa L, Martia M, "Mental Health and Social Distancing During COVID-19 in African Settings," J. Med. Res., vol. 7, no. 1, pp. 1–3, 2021.

[14] S. M. Smith, "Determining Sample Size : How to Ensure You Got The Correct Sample Size. E-Book (c) Qualtrics Online Sample.," Qual. Health Res., vol. 10, no. 1, pp. 3–5, 2013, [Online]. Available: https://uncw.edu/irp/ie/resources/documents/qualtrics/determining-sample-size-2.pdf

[15] J. L. Jensen, I. E. Blanchard, B. L. Bigham, K. N. Dainty, D. Socha, and A. Carter, "Methodology for the development of a canadian national EMS research agenda," BMC Emerg. Med., vol. 11, no. 1, p. 15, 2011, doi: 10.1186/1471-227X-11-15.

[16] R. B. Yapi et al., "Knowledge, attitudes, and practices (Kap) regarding the covid-19 outbreak in côte d'ivoire: Understanding the non-compliance of populations with non-pharmaceutical interventions," Int. J. Environ. Res. Public Health, vol. 18, no. 9, pp.

1–21, 2021, doi: 10.3390/ijerph18094757.

[17] O. P. Mehta, P. Bhandari, A. Raut, S. E. O. Kacimi, and N. T. Huy, "Coronavirus Disease (COVID-19): Comprehensive Review of Clinical Presentation," Front. Public Heal., vol. 8, no. January, pp. 1–9, 2021, doi: 10.3389/fpubh.2020.582932.

[18] F. Jiang, L. Deng, L. Zhang, Y. Cai, C. W. Cheung, and Z. Xia, "Review of the Clinical Characteristics of Coronavirus Disease 2019 (COVID-19)," J. Gen. Intern. Med., vol. 35, no. 5, pp. 1545–1549, 2020, doi: 10.1007/s11606-020-05762-w.

[19] F. of P. Health., "Good Public Health Practice framework," what public health practice is. Faculty of Public Health., 2016.

[20] L. Cirrincione et al., "COVID-19 Pandemic: Prevention and Protection Measures to Be Adopted at the Workplace," Sustainability, vol. 12, no. 9, p. 3603, Apr. 2020, doi: 10.3390/su12093603.

[21] P. Gellert and F. Tille, "What do we know so far? The role of health knowledge within theories of health literacy," Eur. Heal. Psychol., vol. 17, no. 6, pp. 266–274, 2015, [Online]. Available: https://pdfs.semanticscholar.org/091c/9f58a507fd7a60ce14aee2e7397da7b9a26e.pdf?_ga=2.234445790.1557863600.1589130400-1802008879.1589130400

[22] S. Kundu et al., "Knowledge, attitudes, and preventive practices toward the COVID-19 pandemic: an online survey among Bangladeshi residents," J. Public Heal., 2021, doi: 10.1007/s10389-021-01636-5.

[23] B. T. Flatie and A. Munshea, "Knowledge, Attitude, and Practice towards Malaria among People Attending Mekaneeyesus Primary Hospital, South Gondar, Northwestern Ethiopia: A Cross-Sectional Study," J. Parasitol. Res., vol. 2021, 2021, doi: 10.1155/2021/5580715.

Celebrating the World Antimicrobial Awareness Week (WAAW 2022) in Rwanda

Noel Gahamanyi[1,*], Leandre Ishema[2], Jean Paul Mushayija[3], Laurien Ntamugabumwe[4], Emile Ngabo[5,9], Eric Mugabo[5], Olivier Byiringiro[6], Sylvestre Iradukunda[7], Jean Claude Rukundo[8], Denyse Umugwaneza[2], Hugor Shema[2], Misbah Gashegu[2], Edson Rwagasore[2]

[1]*Biology Department, School of Science, College of Science and Technology, University of Rwanda, Kigali, Rwanda.*
[2]*Rwanda Biomedical Centre (RBC), Kigali, Rwanda*
[3]*FAO Rwanda, Kigali, Rwanda*
[4]*Vet Connect Rwanda, Kigali, Rwanda*
[5]*OAZIS Health; Kigali, Rwanda*
[6]*Nurse and Midwives Students Association in Rwanda, Kigali, Rwanda*
[7]*Rwanda Pharmaceutical Students Association, Kigali, Rwanda*
[8]*Rwanda Agriculture and Animal Resources Board, Kigali Rwanda*
[9]*School of Medicine and Pharmacy, College of Medicine and Health Science, University of Rwanda, Kigali, Rwanda*

*Corresponding author:
Dr. Noel Gahamanyi
College of Science and
Technology, University of
Rwanda, Kigali, Rwanda
Email:gahanoel1984@gmail.
com

ABSTRACT

Antimicrobial resistance (AMR) is among the top ten threats facing humanity, and human activities are the major drivers of this process. The quadripartite – the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), the World Organization for Animal Health (WOAH), and the United Nations Environment Programme (UNEP) organize a World Antimicrobial Awareness Week (WAAW), celebrated from 18-24 November every year. In 2022, the theme was "Preventing Antimicrobial Resistance Together''. In Rwanda, several activities including (i) Radio talks/ TV shows, (ii) a public lecture at the University of Rwanda, (iii) a scientific workshop and training veterinary paraprofessionals and healthcare providers in Nyanza district, (iv) Car free day in Huye district, and (v) Social media engagement using twibbons were conducted. During the WAAW, messages related to AMR were delivered to a diverse audience. The covered topics included but were not limited to: (i) drivers of AMR, (ii) the consequences associated with AMR, and (iii) the adoption of One Health approach to tackling the AMR threat. Promoting awareness of AMR alone is not enough. Other interventions like increasing diagnostic centers, surveillance of AMR among commonly reported pathogens, enforcing laws to ensure the quality of existing antimicrobials, and empowering research are all needed if we want a bright future for the generations to come.

INTRODUCTION

Antimicrobials have dramatically reduced morbidity and mortality from infectious diseases like pneumonia, influenza, and tuberculosis [1]. The development of resistance to antimicrobials is a natural phenomenon [2], but the excessive use of antimicrobials, mainly in livestock and human medicine, accelerates this resistance [3, 4]. Alexander Fleming was among the first to warn about the potential resistance to penicillin if used in too few doses or for a short period during treatment [1]. Antimicrobial Resistance (AMR) occurs when bacteria, fungi, viruses, and parasites no longer respond to antimicrobial agents. As a result of drug resistance, antibiotics and other antimicrobials become ineffective and infections become difficult or impossible to treat, increasing the risk of disease spread, severe illness and death. Globally, AMR poses a major threat to modern medicine [5] and is regarded as an overlooked pandemic [6]. A recent study estimated that in 2019, 4.95 million people died from AMR infections, while 1,27 million deaths were directly attributed to bacterial AMR, which was higher than the deaths attributable to HIV and Malaria [7]. Apart from deaths, AMR is associated with long hospitalizations and the use of second/third-line antimicrobials, which are expensive for poor individuals [6, 8]. The problem of AMR threatens several processes requiring antimicrobials like surgery, organ transplantation, and people undergoing cancer treatment. In low-and middle-income countries (LMICs), data on AMR are scarce [6], but the limited available literature proved the increasing number of AMR pathogens [8, 9].

The AMR quadripartite organizations – the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), the World Organization for Animal Health (WOAH), and the United Nations Environment Programme (UNEP) organize a World Antimicrobial Awareness Week (WAAW), celebrated between 18-24 November every year. WAAW aims at promoting awareness and understanding of AMR and inform of best practices to reduce its emergence and spread [10, 11]. The theme for the year 2022 was ''Preventing Antimicrobial Resistance Together'' [12, 13]. It is against this background that the FAO_RWANDA, Rwanda Biomedical Centre (RBC), the University of Rwanda, the Rwanda Agriculture and Animal Resources Board (RAB), Vet Connect Rwanda, OAZIS Health, Rwanda Pharmaceutical Students Association (RPSA), and the Nurse and Midwives Students Association in Rwanda (NMSAR) organized several activities to celebrate the WAAW 2022 in Rwanda. The main objective of these activities was to "raise awareness and communicate the importance of the One Health approach in addressing the threat of AMR. The details of carried out activities are given below.

ACTIVITIES CONDUCTED

Radio talks and TV shows

To promote awareness of AMR, several radios (Rwanda Broadcasting Agency radios including Radio Rwanda, Radio Huye, Radio Rusizi, Radio Rubavu, and Radio Nyagatare); Radio Isango, and three TV stations (Rwanda TV, Isango TV, and BTN TV) were used to deliver the message on antimicrobial resistance (Figure 1). The message covered several components, like (i) when do we say an antimicrobial was misused? (ii) how do microorganisms develop resistance to used antimicrobials? (iii) consequences of misusing antimicrobials, (iv) the role of everyone and multisectoral collaboration in fighting against AMR, and (v) the aim of the campaign. During the talks/shows, the community was allowed to call and interact with the panelists from diverse backgrounds representing the One Health.

Public lecture on antimicrobial resistance at the University of Rwanda

On 23rd November, a public lecture took place at the University of Rwanda, College of Science and Technology (Figure 2). The covered topics included: (i) an introduction to the AMR, (ii) antimicrobial use and resistance in animals, case of Rwanda, and (iii) weapons against AMR and future perspectives in Sub-Saharan Africa (SSA). The audience included students and staff from UR_CST. An interactive session held after the three presenters showed the willingness to learn more about AMR.

A scientific workshop and training veterinary paraprofessionals on AMR

This scientific workshop and training took place in Nyanza district, Rwanda, from 23-24th November 2022 (Figure 3). During this workshop,

Figure 1: *Ms. Yvonne Ingabire, RBA presenter (left), Dr. Leandre Ishema from RBC (second from left), Dr. Candide T. Ngoc from WHO-Rwanda, Dr. Otto Muhinda from FAO-Rwanda (right) at Rwanda television launching the World Antimicrobial Awareness Week 2022.*

25 veterinary paraprofessionals and health professionals were trained on AMR. The covered topics include: (i) One Health Multisectoral Coordination Mechanism (OH-MCM) to address AMR, (ii) Rwanda Agriculture, Animal Resources Development Board (RAB) interventions about AMR, (iii) Understanding AMR & its drivers, and possible solutions, (iv) AMR National action plan and Rwanda Biomedical Centre (RBC) intervention, (v) Prudent use of antibiotics in livestock, (vi) Role of the pharmacists to address AMR, and (vii) One Health and AMR.

Social media engagement using twibbons
This year, we carried out an open online campaign where government officials from different organizations and the general community were allowed to share a message on preserving antimicrobials. In total, 123 people joined the campaign, and posters with messages and pictures were shared.

Figure 2: *The community (students and staff) of UR_CST listening to the talk of Dr. Denyse Umugwaneza from RBC during the WAAW2022.*

Figure 3: *Dr. Noel Gahamanyi from the University of Rwanda while discussing different types of antimicrobials.*

Car-free day in Huye

The organizing team joined the Huye car-free day with T-shirts showing this year WAAW's theme, "Preventing AMR together" (Figure 4). After jogging, RBC representatives addressed the community, where more than 500 people attended the event.

CONCLUSION

In a nutshell, this campaign empowered the Rwandan community with crucial basic information needed to preserve antimicrobials and prevent AMR. It is estimated that the campaign reached more than 8 000 people with the prepared message through radio talks and TV shows, public lecture at UR_CST, training healthcare professionals on AMR in Nyanza district, online campaign, and the car free day. We recommend that more partners join the WAAW to ensure synergy, impact, and program sustainability. AMR awareness campaign should be a continuing activity and should not be conducted only during the WAAW.

Acknowledgement

Figure 4: *Banner with the WAAW2022 theme held by people who attended the car-free day in Huye*

REFERENCES

[1] R. Aminov, "History of antimicrobial drug discovery: Major classes and health impact," Biochem. Pharmacol., vol. 133, pp. 4–19, Jun. 2017, doi: 10.1016/j.bcp.2016.10.001.

[2] J. T. Hall et al., "A call for action to the biomaterial community to tackle antimicrobial resistance," Biomater. Sci., vol. 8, no. 18, pp. 4951–4974, 2020, doi: 10.1039/D0BM01160F.

[3] Z. I. Kimera, G. Frumence, L. E. G. Mboera, M. Rweyemamu, S. E. Mshana, and M. I. N. Matee, "Assessment of Drivers of Antimicrobial Use and Resistance in Poultry and Domestic Pig Farming in the Msimbazi River Basin in Tanzania," Antibiotics, vol. 9, no. 12, Art. no. 12, Dec. 2020, doi: 10.3390/antibiotics9120838.

[4] S. I. Saeed, A. Mergani, E. Aklilu, and N. F. Kamaruzzaman, "Antimicrobial Peptides: Bringing Solution to the Rising Threats of Antimicrobial Resistance in Livestock," Front. Vet. Sci., vol. 9, 2022, Accessed: May 29, 2022. [Online]. Available: https://www.frontiersin.org/article/10.3389/fvets.2022.851052

[5] L. Nisabwe et al., "Knowledge and attitudes towards antibiotic use and resistance among undergraduate healthcare students at University of Rwanda," J. Pharm. Policy Pract., vol. 13, no. 1, p. 7, Apr. 2020, doi: 10.1186/s40545-020-00207-5.

[6] R. Laxminarayan, "The overlooked pandemic of antimicrobial resistance," The Lancet, vol. 0, no. 0, Jan. 2022, doi: 10.1016/S0140-6736(22)00087-3.

[7] C. J. Murray et al., "Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis," The Lancet, vol. 0, no. 0, Jan. 2022, doi: 10.1016/S0140-6736(21)02724-0.

[8] N. Gahamanyi, L. E. G. Mboera, M. I. Matee, D. Mutangana, and E. V. G. Komba, "Prevalence, risk factors, and antimicrobial resistance Profiles of thermophilic Campylobacter species in humans and animals in Sub-Saharan Africa: A systematic review," International Journal of Microbiology, Jan. 14, 2020. https://www.hindawi.com/journals/ijmicro/2020/2092478/ (accessed Nov. 23, 2020).

[9] D. F. Hlashwayo, B. Sigaúque, E. V. Noormahomed, S. M. S. Afonso, I. M. Mandomando, and C. G. Bila, "A systematic review and meta-analysis reveal that Campylobacter spp. and antibiotic resistance are widespread in humans in sub-Saharan Africa," PLOS ONE, vol. 16, no. 1, p. e0245951, Jan. 2021, doi: 10.1371/journal.pone.0245951.

[10] D. Wu, T. R. Walsh, and Y. Wu, "World Antimicrobial Awareness Week 2021 — Spread Awareness, Stop Resistance," China CDC Wkly., vol. 3, no. 47, pp. 987–993, Nov. 2021, doi: 10.46234/ccdcw2021.241.

[11] N. Pariente and on behalf of the P. B. S. Editors, "The antimicrobial resistance crisis needs action now," PLOS Biol., vol. 20, no. 11, p. e3001918, Nov. 2022, doi: 10.1371/journal.pbio.3001918.

[12] WHO, "Preventing antimicrobial resistance together: Quadripartite announces WAAW 2022 theme," 2022. https://www.who.int/news/item/04-07-2022-world-antimicrobial-awareness-week-2022-preventing-antimicrobial-resistance-together (accessed Jan. 09, 2023).

[13] B. J. Langford et al., "Ten ways to make the most of World Antimicrobial Awareness Week," Antimicrob. Steward. Healthc. Epidemiol., vol. 2, no. 1, p. e187, ed 2022, doi: 10.1017/ash.2022.320.

About the Rwanda Public Health Bulletin (RPHB)

The Rwanda Public Health Bulletin (RPHB) is a printed and open access, peer-reviewed journal, published as the flagship scientific and technical periodical publication. RPHB is a public health bulletin launched in March 2019 by the Rwandan Ministry of Health, through the Rwanda Biomedical Centre (RBC) in collaboration with the CDC Foundation and with support from Bloomberg Philanthropies Data for Health Initiative.

Mission

To serve as a scientific information dissemination platform of national and international significance, mainly in areas related to the Rwanda Ministry of Health's essential mission to strengthen national and local health systems and improve the health of the people of Rwanda. The Rwanda Public Health Bulletin publishes disease surveillance summaries, public health response guidelines, public health notices, case reports, outbreak reports, original research papers, and policy briefs among others. It generally features issues of importance to its targeted audience, which is health professionals, academic researchers, policymakers and anybody interested in health issues. Articles for publication are received from doctors, nurses, allied health professionals, students, policymakers, government bodies, non-governmental bodies and others.

Aim

To bridge the gap in public health information sharing between policy-makers, researchers, health professionals and practitioners.

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INSTRUCTIONS TO AUTHORS

All works submitted to this bulletin will have to belong to the types of articles stated below:

1. ORIGINAL RESEARCH

Referred to as "Primary Research" pioneer in a determined domain. It can be from various aspects: Clinical features, pathophysiology, biochemistry, molecular biology, etc...

THE TITLE

The title of the article should be concise and informative. It should contain enough thoughts on the subject.

ABSTRACT

Abstract of 250 words maximum must accompany each manuscript and be divided into 4 paragraphs with the following headings and MeSH keywords:

Introduction: stating the purposes/aims of the work; the research undertaken, the hypothesis tested or the procedure evaluated.
Materials and methods: briefly stating what was done and what materials were used, including the number of subjects, the methods to assess the data and to control bias.
Results: Providing key findings of the study, including indicators of statistical significance, actual numbers, as well as percentages.
Conclusion: Summarizing in 1 or 2 sentences the work on the basis of the findings. It emphasizes new and important aspects of the study or observations.

THE MAIN TEXT

The text of observational and experimental articles is divided into sections with the following headings: Introduction: should always begin the text, and requires brevity and focuses. It conveys the nature and purpose of the work, and quotes the relevant literature. Only strictly pertinent background information is necessary for understanding why the topic is important. We suggest the final paragraph clearly states the hypothesis or purpose of the study.

METHODS

Details of clinical and technical procedures should follow the introduction. A clear description of the selection of the observational or experimental subjects should be given. The identification of all aspects of the study, its reasoning, and the related relevance should be explicitly justified. In case, the study was done in a particular way, the guiding principles should all be clarified. Exclusion and inclusion criteria or partial inclusion, the reliability index, the confidentiality index, the analysis step, and the data collection processes should be also carefully specified. This section should provide sufficient details on the methods, instrumentation, procedures, all drugs and chemicals used (including generic names, doses, routes of administration). It should allow other workers to reproduce the study if necessary.
This section should also state the self-evaluation of the study by: independent/consensus readings blinded or unblinded to other information and estimate the fluctuation of recall biases by random ordering of studies.

Be clear about the retrospective or prospective nature of the study. Finally, provide references to established methods, including statistical methods that have been published, forthcoming, or that may not be well known. New description or substantially modified methods may be used however, give reasons for the use of these techniques, and evaluate their limitations. Statistical methods should be described with enough details to enable a knowledgeable reader with access to the original data to verify the reported results. A general description of methods would be defined in the methods section, whereas a specific statistical method used into analysis would be summarized in the results section. Any general use of the computer program should be

specified, and more details have to be clarified about any randomization issues.

RESULTS

Logical sequence of presentation of results is required in the text; along with tables, and illustrations. Repetition of data from illustrations into the text should be avoided; however, emphasize or summary of only important observations would be helpful. Avoid the ''non-technical use" of technical terms in statistics which should be defined and reserved for the right purpose. Moreover, define all those statistical terms aside with or including abbreviations and/or most used symbols. Any complication and/or unexpected finding should be reported and the more possibly explained and the author should report lost to follow up and dropouts from a clinical trial.

DISCUSSION

Use ample subheadings. Emphasize the new and important aspects of the study and the conclusions that follow from them. Avoid repetition of details included in other parts. This section requires the mention of the implication of the findings, and their limitations for future research, involving relating the observations to other relevant studies.

Finally, the conclusions should be linked to the goals of the study; though mostly avoiding:

Unqualified statement not completely supported by the data

Statement on economic benefits and costs unless the report includes economic data and analyses

Claim of priority and alluding to work that has not been completed.

Whereas new hypotheses could be suggested when warranted, but they should be clearly labeled as such and recommendations, when appropriate and needed, may be given.

2. CHECKLIST FOR SURVEILLANCE REPORTS

Disease surveillance summaries are reported following the checklist below:
Title: Compose a title that includes the name of the health condition, population, time and place.
Abstract: Provide a structured abstract including the following sub- headings: Background; Objectives; Methods; Results; and Conclusion.

INTRODUCTION

Context: Summarize the current situation regarding the health condition under surveillance and identify why it is important. Objectives: State the objective of the surveillance report.

METHODS

Setting: Describe the setting, locations and dates of the surveillance period.
Population: Describe the population under surveillance. Definitions: Provide definitions for each health event under surveillance, including

case definitions and any public health interventions. **Information sources**: Describe all data sources, including the objective of any surveillance systems, what data were collected and how data were gathered, transferred and stored. Supplementary data: If appropriate, note where to access supplemental material (e.g., www.opendata.gc.ca). **Data quality, missing data and reporting delays:** Describe how the data quality was assessed. Explain how missing data were addressed. If data is reported by date of diagnosis or symptom onset, include a statement about whether the data for the most recent periods may be revised.

DATA ANALYSIS

Describe any analytical methods used providing sufficient detail to enable a knowledgeable reader with access to the original data to judge its appropriateness and to assess the reported results.

RESULTS

Descriptive: Provide a summary of the descriptive data, including demographics.
Data Quality: Report on data quality (e.g., completeness, missing data, under reporting)
Analytic data: Provide a summary of the analysis including (when indicated) estimates of trends. When applicable, point estimates should include appropriate indicators of measurement error such as 95% confidence intervals (e.g., average annual percentage change used to describe trends or odds ratios used to describe subgroup differences).
Figures: Create the minimum number of figures to highlight key results. Create a title that includes person, time and place.

DISCUSSION

Key results: Summarize key results with reference to study objectives
Comparison: Consider these findings in relation to the current literature. Strengths and weaknesses: Discuss the strengths and weaknesses of the study (data quality, completeness, sources of

potential bias). Interpretation and generalizability: Provide a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies and other relevant evidence.
Conclusion: Ensure conclusions address objectives and follow from the results.

3. PUBLIC HEALTH NOTICES / OUTBREAK REPORTS

Following the Center for Disease Control recommendations, for public heath notices and outbreak reports to be published they need to cover all four components as stated below:

INTRODUCTION

Generally, the introductory paragraph should begin with 1 to 3 sentences establishing the existence of the outbreak or underlying public health problem (e.g., "On January 2, 2008, the Nevada State Health Division contacted CDC concerning surveillance reports received regarding two persons recently diagnosed with acute hepatitis C."). The introductory paragraph also usually contains: a) a statement that an investigation was conducted, when and by whom; b) the most important finding(s); c) the actions taken to stem the outbreak; and d) a statement of the public health implications and actions that should be taken in response to the investigation. Investigation and results: First, present the initial investigation and its findings. This might include: 1) a description of the setting and a statement of how the outbreak came to the attention of health authorities; 2) a clinical description of the index case or initial cases; 3) initial key test results; and 4) hypothesis generation activities and results. Next, summarize the full investigation, including: case definition, case-finding activities, method of investigation, and results. Cases should be counted and described by clinical characteristics, treatment, and outcome, as well as time, place, and person descriptive results. Next, present the methods and results of any analytic epidemiologic studies (e.g.,

cohort or case-control studies). Finally, provide the results of any relevant microbiologic, genetic, or toxicologic results, followed by the results of any testing of environmental samples. Public health response: When appropriate, a brief description summarizing any public health interventions taken and the results of the interventions follows.

DISCUSSION

Same as for a Full Report, except that a Limitations paragraph might not be required for an Outbreak Report.

4. POLICY BRIEFS

This bulletin will use guidelines on reporting/ publishing policy notes as they are suggested by the Center for Disease Control (CDC). As the CDC defines them; Policy Notes are intended to announce new official policies or recommendations (e.g., from ACIP or CDC). These reports can be thought of as briefs. Maximum word count at submission is 1,400 words. Up to three tables, figures, or boxes may be included. Policy Notes contain no Discussion or Limitations, and a summary box is not required. Although policy notes or brief might vary, following is a rough guide of what basic notes should have: Introduction: The introductory paragraph should be limited to 150–200 words. It might contain all or some of the following components: a brief introductory statement orienting the reader to the topic and placing it in context, a brief description of the public health problem, a brief statement of the rationale for the policy or recommendation, mention of the most important parts of the policy or recommendations, and one or two sentences stating the conclusions and the public health implications of the new policy or recommendations.

BACKGROUND

The Policy Note should include a paragraph after the introduction that summarizes background information relevant to the policy or recommendation that can help the reader understand the context and need for the policy or recommendation.

Methods: Should include a summary of the methods used to establish the policy or recommendation, including answers to some or all of these questions: Who was involved in the production of the guidelines or recommendations, and how? What evidence base was considered? What was the rationale for considering this evidence base? Was other evidence excluded from consideration and, if so, why? Rationale and evidence: The Policy Note should provide a concise review of the rationale for the policy or recommendation and a descriptive review of the scientific evidence used to establish it. It should include an explanation of how the policy or recommendation adds to, or differs from, relevant policies or recommendations established previously. Presentation of the policy or recommendation: The policy or recommendation should state clearly when it takes effect and to whom and under what circumstances it applies.

DISCUSSION OR COMMENT

The Policy Note should comment on the likely impact of the new policy or recommendation and plans for assessment of the policy or recommendation

5. CASE REPORTS

These are reports of an individual patient on their symptoms, treatment reactions on a disease or condition of interest. These reports normally focus on unusual reactions or occurrences. Similar cases to other research reports, case reports might include a literature review of previous similar. Case reports might also address positive patient outcome on particular treatment guidelines or individual impact of a particular intervention. These are mainly used for educational and decision-making purposes. Case reports are normally reported following a checklist found at the CARE Guidelines.

Rwanda
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