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RESEARCH ARTICLE

COMMUNITY KNOWLEDGE, AWARENESS AND ATTITUDES TOWARDS ANTIMICROBIAL RESISTANCE IN QASSIM REGION, SAUDI ARABIA

Rayan Saud Alharbi, Fahad Saleh Alharbi, Muneer Moleh Alharbi, Fayez Abduallah Alfawaz and Omar Sanat Alharbi

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Abstract

Introduction: Antibiotic usage for both treating infections and preventing them is escalating the problem of antimicrobial resistance (AMR). Antimicrobial drug resistance is becoming a serious issue on a global scale.

Methods: A questionnaire will be used as a study tool in a cross-sectional study to collect data from the study population. The study's randomly chosen sample of 385 residents of Saudi Arabia's Qassim area will provide the data.

Results: Following the findings, men made up 66.2% of the research sample, while women made up 33.8%. 59.7% of the participants had a high level of education. When we analyzed the data from the questionnaire, we discovered that the participants didn't know key crucial facts about antibiotics, which is a sign that they don't know enough about this risky topic.

Conclusion: It is urgently necessary to develop educational programs for the proper use of antibiotics and the avoidance of antibiotic resistance since antimicrobial resistance is a severe worldwide issue that can result in mortality.

Introduction:-

Background:

Resistance of antimicrobials is growing to be a worldwide high-risk problem. Public health is greatly affected by this problem on a global level. Antimicrobial resistance is estimated to be cause of death of at least one patient every 10 minutes in Europe and USA through the spread of infections causes by antimicrobial resistant bacterial strains (Harbarth et al., 2015). This is driven by extensive production and use of antibiotics as 10 million tons of antibiotics are globally consumed every 10 minutes most of it are unrelated to justified medical use (Morgan et al., 2011).

Antibiotics are both used in treatment and prevention of infections which is worsening the case of Antimicrobial Resistance (AMR) as this overuse pressure forces bacterial into mutations to create new resistant strains (Zowawi et al., 2015). Major causes of the rise of antimicrobial resistance are misuse and indiscriminate use of antibiotics for pressuring bacteria into resistance (Laxminarayan, 2014).

The rise of AMR globally resulted In serious issues. Urinary Tract Infections (UTIs) was a common bacterial infection but now it has become difficult to treat because of the emerging resistant strains of bacteria. Some bacteria are resistant to last line of antibiotics and others are called pan-drug resistant strains which were found to be resistant

Corresponding Author:- Rayan Saud Alharbi

to all commercially available antimicrobials. Multidrug resistant bacterial strains are causing serious medication and economic consequences in many parts of the world (Zowawi et al., 2015).

Study Problem:
World Health Organization (WHO) has launched a global campaign to elevate global awareness of AMR in order to encourage people to make the right choices when it comes to the use of antibiotics (WHO, 2022). Effective intervention requires measurement of public understanding of the problem. Public knowledge, beliefs, behavior and attitudes towards AMR should be measured and understood (Shehadeh, 2012). Some previous studies investigated this issue aimed at assessing the use of antimicrobials generally and others were focused on special infections such as Upper Respiratory Tract Infections (URTIs) (Mohanna, 2010; Shehadeh, 2012). Only limited number of studies were conducted to investigate medication compliance and public awareness beliefs toward drug use and misuse. Even less studies were focused on Qassim region (located in central part of Saudi Arabia) despite its estimated population of 14 million (Almosaiteer et al., 2022).

Study Significance:
1. Spread awareness among public population with the severity of the global problem.
2. Provide law makers with statistics about the problem to help setup rules to address this issue in Saudi health law.
3. Study recommendations based on study results will be helpful to the public since the elevation of awareness will help safe lives by decreasing AMR levels.

Study Question:
What is the level of knowledge, awareness and attitudes of public towards the antimicrobial resistance among people of Qassim region, Saudi Arabia?

Literature Review:-

Different studies aimed to investigate and measure public knowledge and/or awareness of antimicrobials and their resistance. Study of Alenazi et al. (2020) has aimed to evaluate the level of knowledge, beliefs, attitude and behaviors toward antibiotic resistance among Saudi public in northern border region of Saudi Arabia. The number of respondents included in the survey was 1095. The cross-sectional study was conducted in northern border region of Saudi Arabia using a self-administered questionnaire in Arabic language and the resulted data were analyzed by means of descriptive analysis. Study showed some misconception and insufficient knowledge regarding antibiotic resistance. There is great concern surrounding the development and spread of resistance resulting from poor knowledge about the dangers of self-medication and misuse of antibiotics.

In 2019, Alqarni and Abdulbari conducted a study aiming at determining knowledge and attitude of the public towards antibiotic use in Alkharj, Saudi Arabia. Researchers conducted a cross-sectional survey in Alkharj, Saudi Arabia between July 2017 and October 2017 using self-administered questionnaire with included questions on study sample demographic characteristics, antibiotic usage, knowledge and attitude towards antibiotics use. Study sample was composed of 387 fully completed questionnaires. Study participants who have good knowledge towards antibiotics use also showed positive attitude towards antibiotics use. Some specific groups among study sample need to be targeted by educational intervention in terms of appropriate antibiotic use, such as those who have received a low level of education and those in receipt of a low monthly income.

Another study of Al-Shibani et al. (2017) was conducted in order to assess the knowledge, attitude, and practice of antibiotics' use and misuse among adult population living in Riyadh region, Saudi Arabia. Their study was a cross-sectional study and self-administered questionnaire was distributed to study participants during the period between March 2016 and January 2017 in the outpatient department of King Khalid University Hospital in Riyadh, Saudi Arabia. Study sample was composed of 1966 respondents. Study result showed how adults in Riyadh region showed insufficient knowledge and understanding regarding the safe use of Antibiotics (Abs) consumption among the population.

In research, done by Bin Nafisah et al., the authors looked into how the public perceived antibiotics, their use and risks, as well as their availability as over-the-counter and non-prescription medications. There were 473 competitors in all. Coffee shops and two universities, one of which had a female-based university, a high school, and a secondary hospital were all chosen at random by the writers. A self-administered questionnaire was used to gather the data.

They discovered that the percentage of people who use antibiotics without a prescription is lower than the number reported in 2011 (82%). Viral diseases accounted for the largest percentage of antibiotic orders. The need for antibiotics for viral illnesses revealed a propensity in females. One aspect that affected how people felt about antibiotics was their degree of knowledge. Males (63.9%) are more likely than females to obtain antibiotics for reasons other than infection (Bin Nafisah et al., 2017).

Antibiotic resistance (ABR) trends and their correlation with the flu season in outpatient and inpatient settings in the United States were studied by Gupta et al. They examined the 30-day non-duplicate bacterial isolates obtained from individuals >17 years old at 257 US healthcare facilities between 2011 and 2019 using the BD Insights Research Database to assess their antibiotic susceptibility profiles. For MRSA but not for S pneumonia, the authors saw greater ABR frequencies for inpatients compared to ambulatory individuals. They found a strong correlation between influenza rates and the number of drug-resistant S pneumonia and respiratory MRSA cases per 100 hospital admissions among Gram-positive bacteria. The development of antibiotic resistance in these important respiratory pathogens has the potential to complicate the management of co-infections with influenza, especially community-acquired pneumonia, and to negatively affect patient outcomes. (Gupta et al., 2022).

Methodology:-

In studies involving human subjects, Methods for sampling population and the type of sampling procedure (Subject Recruitment, inclusion/exclusion, advertising and Selection), Location, Duration, Specimens, investigations, Potential Risks, Potential Benefits, Contact People)

Study Location:
Data will be collected from study population who live in Qassim region, Saudi Arabia.

Study Population:
Saudi and non-Saudi population living in Qassim region, Saudi Arabia

Sample Size Estimation:
The Inclusion criteria for this study were Saudi and non-Saudi males and females above the age of 16 years, living in Qassim region, agree to participate in the study and not work in health sector.

$$Necessary\ sample\ size = \frac{(Z\ score)^2 \times standard\ deviation \times (1 - standard\ deviation)}{(margin\ of\ error)^2}$$

Sample size achieved through the following equation:
Sample size is 385 or more measurements/surveys are needed to have a confidence level of 95% that the real value is within ±5% of the measured/surveyed value.

Sampling method and subject recruitment:
Random sampling technique is adopted as it best serves the purpose of the study as this type of sampling ensures that results obtained from the sample gives approximate results to what it would have been if entire population was used.

Research instruments:
A questionnaire is adopted from Alenazi et al. (2020) to serve as the instrument of data collection, it will be sent to study sample through google survey link on social media platforms.

Results:-

The number of respondents included in the survey was 385, with the majority,66.2% being male. The socio-demographic characteristics of the respondents are presented in Table 1. The largest percentage of the participants (41.3%) was in the age range of 26 – 33 years and 27.8% in the age range of 18 – 25 years. Most of the participants were university graduates (%59.7) and Saudi (95.8%). The knowledge and beliefs of antibiotics resistance on the part of the study participant was elicited by using ten statements (Table 2).

Table 1:- Demographic characteristics of study subjects (n=385).

		Count	%
Age	25 - 18	107	27.8%
	33 - 26	159	41.3%
	41 - 34	84	21.8%
	49 - 42	24	6.2%
	> 50	11	2.9%
Gender	Male	255	66.2%
	Female	130	33.8%
Nationality	Saudi	369	95.8%
	Other	16	4.2%
Education Level	Uneducated	7	1.8%
	Primary Education	15	3.9%
	Secondary Education	133	34.5%
	Higher Education	230	59.7%
Monthly Income	< 5000	147	38.2%
	5000 – 10000	135	35.1%
	> 10000	103	26.8%
Job status	Unemployed	117	30.4%
	Employed	268	69.6%
Residence	Urban	197	51.2%
	Rural	188	48.8%
Antimicrobial purchase	Without prescription	37	9.6%
	With prescription	348	90.4%
Antimicrobial consumption	1-3 antibiotics	148	38.4%
	4-6 antibiotics	9	2.3%
	> 6 antibiotics	1	0.3%
	Did not use	227	59.0%

Table 2:- Knowledge and beliefs of study subjects about antibiotic resistance. (n=385).

		Have you ever heard about antibiotic resistance?			
		Count	%	chi-square	sig.
Antibiotic resistance means that bacteria would not be killed by antibiotic	No	51	13.2%	35.58	.000*
	Don't know	110	28.6%		
	Yes	224	58.2%		
Antibiotic resistance bacteria is difficult to eradicate	No	95	24.7%	47.60	.000*
	Don't know	128	33.2%		
	Yes	162	42.1%		
Indiscriminate use of antibiotics is the cause of bacterial resistance	No	58	15.1%	45.52	.000*
	Don't know	101	26.2%		
	Yes	226	58.7%		
Use antibiotic when there is no need is a cause for bacterial resistance	No	110	28.6%	37.80	.000*
	Don't know	127	33.0%		
	Yes	148	38.4%		
Incomplete course of antibiotic lead to bacterial resistance	No	52	13.5%	38.80	.000*
	Don't know	142	36.9%		
	Yes	191	49.6%		

Overuse of antibacterial lead to bacterial resistance	No	63	16.4%	45.64	.000*
	Don't know	137	35.6%		
	Yes	185	48.1%		
Longer duration of antibiotic increase bacterial resistance	No	71	18.4%	43.97	.000*
	Don't know	173	44.9%		
	Yes	141	36.6%		
Resistant bacteria can be transmitted form patient to another	No	77	20.0%	21.31	.000*
	Don't know	163	42.3%		
	Yes	145	37.7%		
Antibiotic resistance occur due to resistance in the body not the bacteria	No	87	22.6%	31.27	.000*
	Don't know	168	43.6%		
	Yes	130	33.8%		
In your opinion, antibiotic can be stopped	No	84	21.8%	25.60	.000*
	Don't know	123	31.9%		
	Yes	178	46.2%		

*p-Value Calculated with chi-square test.
*p-value ≤0.05 consider as significant.

The majority of the participants (58.2%) heard about antibiotic resistance and %16.9of them mentioned the social media as the source of information about this issue while 21.6% mentioned the pharmacist as the source of information.

Only 58.2% ($p<0.05$) of study subjects were aware that antibiotic resistance means that bacteria would not be killed by the antibiotics. 42.1% ($p<0.05$) were aware that antibiotic resistance bacteria is difficult to eradicate. 58.7% ($p<0.05$) were aware that indiscriminate use of antibiotics is the cause of bacterial resistance.

38.4% ($p<0.05$) were aware that use antibiotic when there is no need is a cause for bacterial resistance. 49.6% ($p<0.05$) were aware that incomplete course of antibiotic lead to bacterial resistance.

48.1% ($p<0.05$) were aware that overuse of antibacterial lead to bacterial resistance, 36.6% ($p<0.05$) believed that longer duration of antibiotic increase bacterial resistance. 37.7%were aware that resistant bacteria can be transmitted from patient to another. 38.8% ($p<0.05$) believed that antibiotic resistance occurs due to resistance in the body not the bacteria. 46.2% believed that antibiotic can be stopped when the patient feel better.

Figure 1 represents the knowledge and behavior of study subjects towards antibiotics use. A large percentage (90.4%) of study subjects take antibiotic with prescription, 38.4% reported taking 1-3 antibiotic each year.

Attitudes of participant towards antibiotic use and antibacterial resistance are presented in Table 3. Large percentage (58.2%; $p<0.05$) of study subjects believed that influenza and common cold can be treated with antibiotics. 54.5%($p<0.05$) believed that antibiotic resistance is a problem can affect them or their family. 27.5% ($p<0.05$) believed that wrong concept of antibiotic resistance is not present here but present in other countries. 38.2% ($p<0.05$) believed that that antibacterial resistance is a worldwide problem. 24.4% ($p<0.05$) believed that antibacterial resistance is only problem for people who regularly take antibiotics and 55.1% ($p<0.05$) believed that health care workers can help in limiting bacterial resistance.

Discussion:-

The present study conducted with the aim to assess knowledge, belief, attitude and behavior of Saudi population towards overuse of antibiotics and antibiotic resistance in Qassim region in Saudi Arabia.

Less than half of the study participants (38.2%; p<0.05) were aware that antibacterial resistance is a worldwide problem and More than half (54.5%; p<0.05) were aware that antibiotic resistance is a problem that can affect them or their families. This result is similar to previous studies where most of the participants did not give importance to the prevalence of the antibiotic resistance. The insufficient awareness about the antimicrobial resistance indicates the need for education interventions using clinical problems which depicts the hazardous effects of antibiotic resistance, can be used to improve as well as make them alert on present and future consequences, which encourages the correct usage of antibiotics by avoiding the resistance which increased all over the world.

There are some wrong beliefs noticed in the attitude of the respondents lead to inappropriate use of antibiotic. Almost, 58.2% (p<0.05) of study subjects believed that antibiotics can be taken for common cold and influenza and which is much higher than reported in previous study by Afzal et al. 2013(17.9% were not aware that cold and flu not bacterial diseases).However, this result is less that reported in previous studies have shown that about 60% and more of their participants believed that antibiotics should be prescribed during cold of viral etiology.

Such wrong and mistaken beliefs may lead to indiscriminate use of antibiotic resulting in increased bacterial resistance. Antibiotic treatment is not necessary in otherwise healthy young adults with common cold because common cold is a viral infection and bacterial co-infection are rare.

The results of the present study indicate that participants High sufficient awareness about the bacterial resistance. Less than half (13.2%; p<0.05) of the participants were aware that antibiotic resistance means that bacteria would not be killed by antibiotic. The present study showed that only (9.6%; p<0.05) of participants take antibiotics without prescription.

An addition, reports from neighboring countries including Iraq, Egypt, Jordan and Palestine as well as other parts of the globe showed the imprudent, overuse and self-medication with antibiotics.

Although (49.6%; p<0.05) of participants were aware that incomplete course of antibiotic lead to bacterial resistance, a large percentage of our study subjects (46.2%; p<0.05) reported that they would stop antibiotic when symptoms improve.

Table 3:- Attitudes of study subjects regarding antibiotic use and antibacterial resistance (n=385).

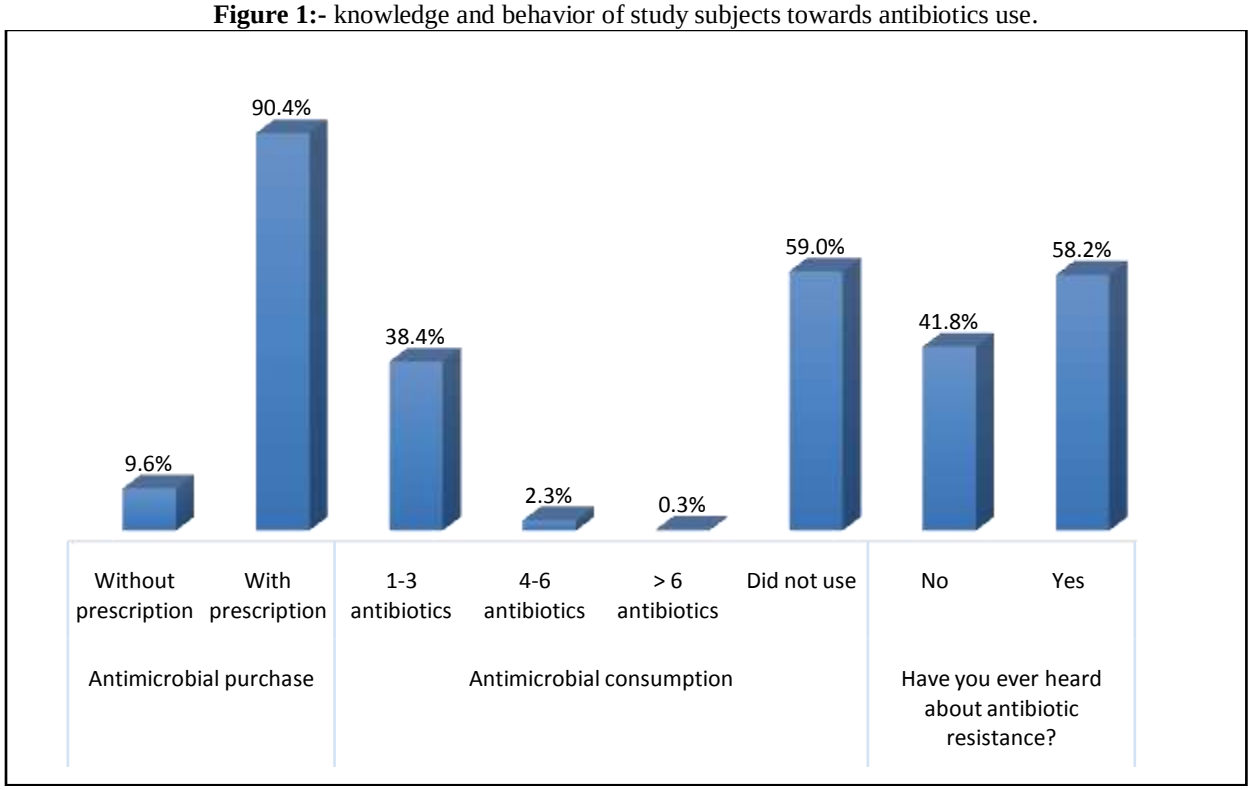
		Have you ever heard about antibiotic resistance?			
		Count	%	chi-square	Sig.
Influenza and common cold can be treated with antibiotics	No	69	17.9 %	18.80	.000*
	Don't know	92	23.9 %		
	Yes	224	58.2 %		
Antibiotic resistance is a problem can affect me or my family	No	53	13.8 %	30.48	.000*
	Don't know	122	31.7 %		
	Yes	210	54.5 %		
Wrong concept of antibiotic resistance is not present here but present in other countries	No	106	27.5 %	28.88	.000*
	Don't know	173	44.9 %		
	Yes	106	27.5 %		
Antibacterial resistance is a worldwide problem	No	54	14.0 %	34.77	.000*

	Don't know	184	47.8 %		
	Yes	147	38.2 %		
Antibacterial resistance is only problem for people who regularly take antibiotics	No	110	28.6 %	31.08	.000*
	Don't know	181	47.0 %		
	Yes	94	24.4 %		
Health care workers can help in limiting bacterial resistance	No	44	11.4 %	11.40	.003*
	Don't know	129	33.5 %		
	Yes	212	55.1 %		

Our study results indicate High awareness and correct practice pattern toward antibiotic use among Saudi people which is consistent with many studies in KSA revealed a high knowledge and correct practice pattern among most of the Saudi subjects. In Qassim, about 9.6% ($p<0.05$) of adult subjects would buy antibiotics without prescriptions.

In our study, the majority of respondents who self-medicate identified pharmacists in private pharmacy as the main source of information. The potential for adverse events is known. Generally, pharmacy staff inquire about patient's allergies, explain potential side effects and also predispose the patient to drug interactions, super infection and also administration of antibiotic which is suitable for diagnosis lead to lower bacterial resistance.

Figure 1:- knowledge and behavior of study subjects towards antibiotics use.



Discussion:-

The potential for antibiotics to save lives and defend against infectious diseases is limited by bacteria's ability to acquire resistance quickly, which frequently leads to therapeutic failure. For both humans and animals, antimicrobial

resistance is a present-day concern. Antimicrobial resistance is fueled by both proper and improper usage of antibiotics. Antimicrobial resistance and the effects of its spread are a persistent public health issue that warrants serious attention (El Zowalaty et al., 2016). In the Qassim area of Saudi Arabia, the study aims to evaluate attitudes, knowledge, and attitudes related to antibiotic resistance.

Demographic characteristics:
In table 1, we studied the demographic details of the sample size. 95.8% of the study's participants are Saudi citizens, according to the data. 66.2% of the participants were male, and 41.3% of them were between the ages of 26 and 33. 59.7% of participants had a high level of education. A job was held by more than half of the respondents (69.6%), although 38.2% of them made less than $5,000 per month. 51.2% of people also resided in cities. Antibiotics were purchased by 90.4% of participants without a prescription, yet 59.0% of people were found to not be utilizing them. On the other hand, Bin Nafisah et al. (2017) discovered that the proportion of people who use antibiotics without a prescription is lower than the percentages previously reported in 2011 (82%).

Knowledge and beliefs of study subjects about antibiotic resistance:
The aim of table 2 is to examine the research sample's knowledge and views concerning antibiotic resistance. The findings revealed that 58.2% of participants agreed that antibiotic resistance indicates that germs are not destroyed by antibiotics and that 42.1% of participants acknowledged that it is challenging to overcome this resistance. The majority of the sample (58.7%) concurred that antibiotic overuse is to blame for the rise in antibiotic resistance. 33.0% of them, however, were unsure as to whether the use of antibiotics for unneeded purposes was the root of this disease. The capacity to cease taking antibiotics was demonstrated by 46.2%, whereas 49.6% acknowledged that future resistance to antibiotics might result from greater usage of them. 42.3% of the sample did not know whether antibiotic usage over an extended time may contribute to the development of resistance, and 44.9% did not know whether it could spread from patient to patient. Additionally, 43.6% were unaware of the veracity of the theory that antibiotic resistance may be a result of the body rather than germs. These findings showed that the research sample didn't know enough about antibiotic resistance. Both the study by Alenazi et al. (2020) and the study by Al-Shibani et al. (2017) indicated that there were some misconceptions and a lack of awareness about antibiotic resistance.

Attitudes of study subjects regarding antibiotic use and antibacterial resistance:
In table 3, the sample's opinions about antibiotic usage and antibacterial resistance were assessed. Moreover, half of the participants (58.2%) agreed that antibiotics may treat colds and the flu, that antibiotic resistance can impact a person's entire family (54.5%), and that medical professionals can assist minimize this resistance (55.1%). However, they were unable to determine if (44.9%) the myth of antibiotic resistance also persisted in other nations except for Saudi Arabia. In addition, they were unsure (47.8%) of whether antibiotic resistance was an international issue and whether it affected only people who continued to use antibiotics. According to research by Gupta et al. (2022), the development of antibiotic resistance hinders influenza therapy from having the intended effects.

Limitations:
Several limitations must be taken into account when interpreting the results. Because the questionnaire was based on the author's network, relevant opinions from persons who were not questioned may have been overlooked. In addition, the questionnaire didn't include persons without gadgets or an internet connection. To evaluate the impact of antibiotics knowledge on the usage of antimicrobial agents, further longitudinal research, a bigger sample size, and in-person surveys are required. For assessing antibiotics usage awareness, the current data offer useful information.

Conclusion:-

Antimicrobial resistance is a severe worldwide issue that affects all people, particularly adults. Despite having a majority of highly qualified participants in the research, they were not enough aware of the issue to address it. In the Qassim region in particular and the Kingdom of Saudi Arabia in general, educational programs must be offered by medical personnel to raise public understanding about antibiotics and the proper way to use them.

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