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REVIEW ARTICLE

Methodology for assessing health risk behaviours among undergraduates in Sri Lanka: a literature review

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Abstract: It is imperative to learn more about the distinctive Health-Risk-Behaviours (HRB) that are culturally acceptable in the lower-resource settings. Therefore, the objective of this review is to identify tools measuring HRBs among undergraduates in Sri Lankan context. A literature review was conducted both manually and electronically through Google Scholar and Hinari and PubMed databases. Self-administered Questionnaires were used in National Surveys and individual studies. Youth-Risk-Behaviour-Surveillance-System was the most commonly used comprehensive HRB assessment tool. The National College Health Risk Behaviour Survey, National College Health Assessment were other widely used instruments. There are few validated tools and multiple short scales or items combined like Health-Promotion-Lifestyle-Profile, Health-Behaviour-Questionnaire or Inventory, DOSPERT scale, Adolescent-Health-Attitude and Behaviour-Survey, Healthy-Lifestyle-Scale, Health-Behaviour-Scale and Health-Behaviour-Checklist. Objective methods for assessing high-risk behaviors (HRBs) include measures of personality and aggression, which have been used to critically quantify violence and accidental injury, as well as biochemical tests for alcohol, nicotine, and other drug use, mechanical or computer sensors, and biological tests such as urinary cultures for sexual risk behaviours. These tools had focused only on specific aspects of HRBs among undergraduates in Western countries and were not comprehensive assessments of HRBs of undergraduates in lower-resource settings. It was evident that there has been a deficit of choices for the adaptation of an HRB tool for undergraduates in lower-resource-settings and a new tool to be developed for Sri Lankan context.

Keywords: Health risk behaviours, risk-behaviors of undergraduates.

INTRODUCTION

World Health Organization (WHO) defines health risk as a factor that raises the probability of adverse health outcomes (WHO 2009). A Health Risk Behaviour (HRB) can be defined as an activity carried out by people with a frequency or intensity that increases the risk of disease or injury (Steptoe, 2007). 'Traditional health risks' include malnutrition, unsafe sex, contaminated water, poor sanitation and hygiene, and indoor smoke. Communities are increasingly exposed to physical inactivity, overweight and obesity, and cigarette and alcohol-related risks. As life expectancies rise with lifestyle changes, these 'modern health risks' become the primary cause of death and disability (Pengpid *et al*., 2014).

There could be variations in HRB depending on the age, sex, geographical and cultural background of the different populations (Peltzer, 2000). Violence and unintentional injuries, drunk and driving, speed driving, road rage, not following safety measures while driving, substance use, unprotected sun exposure and problematic Internet use, poor sleeping are common HRBs assessed globally among youth (Dallazem *et al*., 2019; Fernández-Villa *et al*., 2015; Hayashi *et al*., 2015; Lund *et al*., 2010; Sagar *et al*., 2013; Steptoe, Wardle, Fuller, Davidsdottir, Davou, and Justo, 2002; Wu *et al*., 2019). These HRBs

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can contribute to premature mortalities and several morbidities such as injuries, non-communicable diseases (NCD) and negative mental health outcomes. Therefore, these HRBs have a significant impact on the quality of life of a person (von Bothmer & Fridlund, 2005; WHO, 2011).

Undergraduates are a unique group of people defined as students who study for their first degree in a higher education institute (Emeka & Nyeche, 2016). The transition period from school to university is a substantial life event, which is a particularly tense situation with many challenges such as adjusting existing relationships with family and friends, creating new relationships, and learning methods in a new academic atmosphere (Brooks & DuBois, 1995). Therefore, they are considered a vulnerable group in which they are at risk of HRBs and their consequences globally, because health behaviours that are formed during this period have a significant impact on the occurrence of non-communicable diseases in later life (Steptoe, Wardle, Cui, Baban, Glass, Pelzer, Tsuda, and Vinck, 2002).

During their undergraduate studies physically fit, psychologically mature young adults tend to develop their own identity and make decisions on their own with lots of freedom during which they try to explore beyond their home environment and get new experiences. They acquire certain behavioural patterns through the exposure they experience (Wardle & Steptoe, 1991). Health risk behaviours among undergraduates have been identified as a global phenomenon which demonstrates a considerable cultural diversity (Peltzer, 2000). The degree of HRBs among undergraduates have been researched extensively and regular surveillance had been conducted in the other countries.

Health risk behaviours among young adults have been a health issue of interest worldwide. Unprotected sex, physical inactivity, and the use of tobacco, alcohol, and illicit drugs all contribute to the global burden of disease among people of all ages, accounting for 17% of the worldwide burden of disease. Half of the estimated 150 million young tobacco users who continue to smoke into adulthood are expected to die prematurely. Early drinking habits are linked to alcohol dependency or abuse in adulthood. Early initiation of sex and unprotected sexual behaviours can precipitate sexually transmitted infections leading to infertility, malignancies and HIV infection causing a chronic care burden on health systems and where can be transmitted to infants as well (WHO, 2011).

In Sri Lanka, ragging was considered a form of bullying first year students by seniors at the beginning of each academic year. It could be considered that ragging was a part of the institutional student sub-culture and a part of the normal socialisation process (Gamage, 2017). An approximately half of them had been subjected to some kind of verbal abuse and the number of students who said they had been subjected to physical assault was comparatively low (4.6%) (Premadasa *et al*., 2011). In contrast, a study conducted in India the prevalence of peer-based bullying and victimisation were reported by 98.7%. Among them 63.97% experienced physical bullying, 97.4% verbal bullying and 88.7% reported feeling victimized (Kapoor *et al*., 2016).

Several research studies on different aspects of harmful substance use among undergraduates have been done in different settings. A multi-country cross-sectional study among undergraduates in ASEAN region showed 2.2% uses frequently (>10 times), 14.7% uses infrequently (1-9 times) and 16.9% ever used (at least once) in past 12 months (Yi, Peltzer, *et al*., 2017). In Sri Lanka, few studies have explored the impact of substance use as a HRB among undergraduates. Around 10% of male students smoke, and 7.1 % drink alcohol at least once a month (Jayatissa, 1993) and overall alcohol consumption was 25.7 %. (Wickramaarachchi, 2013) while 30.5% of males and 3.5% of females were current alcohol users (Perera & Torabi, 2012). Another study showed tobacco smoking was prevalent among 40.7 % of male undergraduates (ever smokers), the prevalence of current smokers was 24.6% and former smokers were 11%, (Karunathilake, 2016).

Extensive research has been carried out on SRB especially among vulnerable groups such as undergraduates. A multi-centred cross-sectional study in ASEAN countries revealed the prevalence of having at least one sexual partner in the past 12 months was 10.8%. The prevalence of participants who reported having one and two or more sexual partners in the past 12 months was 8.3% and 2.5% respectively and 54.2 % said they or their partners did not use a condom during their most recent sexual encounter (Yi *et al*., 2018).

In Sri Lanka, 10.9 % ever had sex and 18.2 % had sex with more than one partner. During the previous three months, only 22.2 % of them had used contraceptives during intercourse with someone other than their partner and 25% had engaged in self-sex. However, over 99.4% and 80% of them were aware of HIV/AIDS transmission modes and prevention, respectively. Thirty three percent of them were found to have excellent knowledge while 43.6 % had satisfactory knowledge (Somaratna, 2010). A recent study showed the prevalence of SRB was 12.4 % (95 % CI: 11.8 to 13.1%) past year, and 12.1 % (95 % CI: 11.5 to 12.1%) for the past 3 months (Perera & Abeysena, 2018a; 2018b). Premarital sex was found to be present

in 11.8%, 5.9% had sex with commercial sex workers, 32.6% had multiple sexual partners and 58.8% had never used contraceptives (De Silva, 2018).

Pathological, problematic or heavy internet use and internet addiction, addictive internet behaviours were widely assessed among undergraduates in recent years in both Western and Asian countries (Long *et al*., 2016; Malkanthi, 2018; Nigar & Karim, 2014; Sabbah *et al*., 2019; Saleem *et al*., 2015). In Bangladesh around 29% of undergraduates were identified as having problematic internet use (Islam & Hossin, 2016). Similar to other countries, Sri Lanka also identifies university students as a high-risk group for harmful internet use. It revealed that 16.4% to 41% were highly addicted (Malkanthi, 2018; Sachitra, 2015).

Unhealthy sleeping behaviour has been consistently studied as an HRB among undergraduates. A recent survey revealed that severe nocturnal sleeping problem was seen among 10.4 % of undergraduates in the past month (Peltzer & Pengpid, 2015; 2016). In Sri Lanka, the reported level of sleep ranged from excellent (58.5%) to difficulty falling asleep (13.8%), nightmares (13.5%), snoring (8.4%) and talking while sleeping (5.5%). Before exams, 54 % slept less and 23.2 % slept more. Nearly half of the undergraduates (46.6%) were sleepy for most of the lectures (Rajapaksha *et al*., 2013).

Good personal hygiene practices have a significant role in variables related to healthy living and illness prevention. Personal and household hygienic practices among undergraduates in Sri Lanka were not widely studied. A study showed only 5.53% had good practices, while 26.9% had moderate practices and the majority (67%) had poor hand hygiene practices (Ariyaratne *et al*., 2013).

The importance of studying multiple HRBs among undergraduates is consistently documented in the literature. Review of literature revealed that selected aspects of HRBs in university undergraduates have been studied in various settings in last few decades. In Sri Lanka, apart from the National Youth Health Survey which was conducted in 2012/2013, among the general population, no surveillance system existed in state universities so far except for a few individual researches carried out in a few universities to assess one or two HRBs described under relevant subtopics (De Silva, 2018; FHB, 2013; 2018; Fernando, 2019; Gunawardena *et al*., 2011; Gamage, 2007; Jayatissa, 1993; Madhavika & Kodithuwakku, 2019; Malkanthi, 2018; Sachitra, 2015; Perera & Abeysena, 2018; Premadasa *et al*., 2016; Somarathna, 2010; Karunathilake, 2016; Wicramarachchi, 2013). Despite these, it is high time to explore more culturally specific unique HRBs and emerging modern HRBs and then to implement preventive interventions for HRBs in the future. Therefore, the objective of this study is to carry out a literature search to identify tools measuring common HRBs to use among Sri Lankan undergraduates.

METHODS

A literature review was conducted using several search strategies, both manually in the Post Graduate Institute of Medicine (PGIM) library and main library of University of Colombo, and electronically through Google Scholar and through Hinari, and PubMed databases that was used to search relevant articles. Keywords and subject areas used in the search are given in Table 1. HRB is a concept that is understood differently by different cultures and societies. The occurrence and recognition of HRBs in a country depend on a number of issues at macro and micro levels. Perception of HRBs would differ from one society to another and even from one person to another. The operational definitions related to HRBs among undergraduates in the literature were diverse. Several terms were used to describe HRBs such as "Youth risk behaviour", "Healthy behaviour", "Lifestyle behaviour" and "Health-promoting practices". Furthermore, literature revealed the following different types of HRBs among undergraduates: physical violence, verbal and non-verbal sexual and emotional harassment, cyberbullying, sexting, risky sexual behaviour, insufficient road safety measures, tobacco, alcohol and other substance use, unhealthy eating, lack of physical activity and internet addiction.

Health risk behaviours, risk behaviours, adolescent risk behaviours, prevalence, methods, instruments, undergraduates, and college students. Subject headings used in the Pub Med database were "health risk behaviours"[MeSH Terms] OR "health behaviour"[MeSH Terms] OR "risk-taking"[MeSH Terms] OR risk[Text Word])) AND college[All Fields] AND "students"[MeSH Terms] OR student[Text Word] OR "universities"[MeSH Terms] OR university[Text Word]) AND "students"[MeSH Terms] OR students[Text Word] OR undergraduates[All Fields] used for literature search.

Three widely used Boolean operations used to create search strategies are also given in the annexure. Filters were used to narrow down the search (text availability: Abstract and Free full text; Article type: Books and documents, Journal article, Review, Systematic Review; Publication date: 10 years; Species: Humans; Language: English; Journal: MEDLINE; Age: Young adults). Important research materials were also located using the reference lists included in the papers. Google Scholar

Table 1: Search strategies

Health risk behaviors	Tools	University students	International	Asian
Youth risk behaviors	Instruments	College students	Global	Eastern
Risk behaviors	Questionnaire	Students in higher education institutes	Western	Developing countries
Unhealthy diet	Scientific methods	Students of tertiary education	Global South	South East asia
Lack of physical activity	Paper and pencil method	Undergraduates		
Sedentary life				
Sexual risk				
Unprotected intercourse				
Not using contraception				
Un intended pregnancies				
Termination of pregnancies				
Violence and injuries				
Bullying				
Ragging				
Harassments				
Tobacco use, abuse, addiction				
Alcohol use, abuse, addiction				
Substance use, abuse, addiction				
Suicidal ideation				
Suicide attempts				
Deliberate self-harm				
Problematic internet use				
Problematic smart phone use				
Internet addiction				

updates were generated to keep track of new papers using search techniques. Articles which were not open source were accessed by requesting through the PGIM library.

Inclusion and exclusion criteria

This review encompassed cohort, cross-sectional, and case-control studies, as well as national-level surveys that documented health risk behaviors (HRBs) among undergraduate or college students. No language restrictions were imposed during the literature search. The study population consisted specifically of young adults within the undergraduate or college student demographic. In collaboration with experts in the fields of public health, sociology, and psychology, and with input from members of student groups, the inclusion criteria were refined to focus on HRBs that are prevalent among undergraduates. The review spanned the period from 2020 to 2021, with publications considered from the past 10 years as of 2021; however, there was no rigid time limitation.

The World Health Organisation (WHO) and Centre for Disease Control and Prevention (CDC) websites were also browsed through. To collect more details, experts in the related specialities were directly contacted. The Mendeley reference manager programme was used to create the in-text citations and the reference list.

A literature search was conducted to identify various health risk behaviours or acts used by researchers in other countries among undergraduates and tools adapted to measure HRB among undergraduates in lower resource settings.

RESULTS

Thus, the literature review focused on identifying scales that have been validated and used by researchers in other countries that may be suitable to be adapted to the present study.

Assessment of health risk behaviours among undergraduates

Several assessment methods have been used to measure HRBs among undergraduates in−different settings that could be categorized as follows:

(1) Self-Administered Questionnaires used in National Surveys and Individual Studies

(2) Validated tools to assess HRBs

(3) Multiple short scales or items combined to assess several HRBs

(4) Objective measurements to assess HRBs

The most widely used data collection tools are described below under each subheading.

Self-administered questionnaires used in national surveys and individual studies

In most of the developed countries, university statistics are available on HRBs as there is a systematic record keeping such as Youth Risk Behaviour Surveillance Survey (YRBSS) and National College Health Risk Behaviour Survey (NCHRBS) by Centre for Disease Control and Prevention (CDC) and National College Health Assessment (NCHA) by American College Health Association (ACHA) in the United State of America (USA) and Canada, Harvard School of Public Health College Alcohol Study, The Core Alcohol and Drug Survey. The World Mental Health International College Student (WMH-ICS) was an initiative by WHO to generate data on the unmet need for treatment of mental, substance, and behavioural disorders among college students (Douglas *et al.*, 1997; Hanover, 2013; Kwan *et al*., 2016; Shen *et al*., 2020; Wechsler *et al.*, 1998; Cuijpers *et al*., 2019).

Table 2: List of HRBs tools identified from literature

Name of the tool	Developed by	Year
1. Youth Risk Behaviour Surveillance System (YRBSS)	CDC	1990
2. National College Health Risk Behaviour survey (NCHRBS)	CDC	1995
3. National College Health Assessment (NCHA)	ACHA	2020
4. Health Behaviour Index (HBI)	Stepteo, et al	1991
5. Health Promotion Lifestyle Profile (HPLP-II)	Walker	1995
6. Health Behaviour Questionnaire or Inventory	Juczyński, Z.	2001
7. Domain Specific Risk-Taking Attitude (DOSPERT) scale,	Weber	2002
8. Adolescent Health Attitude and Behaviour Survey (AHABS),	Cheung, Teo, and Hue 2017; Kwan et al. 2013; Malinauskas et al. 2018; Reininger et al. 2003; Ye et al. 2016; Zielinska-Wieczkowska 2016	
9. Healthy lifestyle scale		
10. Health behaviour scale		
11. Health Behaviour Checklist (HBC)	Vickers, et al	1990
12. Healthy Lifestyle Scale for University Students (HLSUS)	Dong, et al	2012
Multiple short scales or items combined to assess several HRBs		
1. Health and Lifestyle Survey	Wardle & Steptoe	1991
-National Health Interview Survey		
2. New South Wales Adult Population Health Survey	Hutchesson et al	2021
-Active Australia study		
-Alcohol Use Disorders Identif ication Test (AUDIT)		
-Drug Use Disorders Identification Test (DUDIT)		
-National Centre for Chronic Disease Prevention		
-Kessler Psychological Distress Scale (K-10) questionnaire		
3. Health risk behaviour-Multi country study	Peltzer and Pengpid	2014

Youth Risk Behaviour Surveillance Survey (YRBSS) and National College Health Risk Behaviour Survey (NCHRBS)

YRBSS was conducted by CDC only to determine the prevalence of accidental injuries and violence, tobacco use, alcohol and other substance use, sexual habits regarding body weight and food preferences among youth but not to investigate the determinants of those HRBs (Brener *et al*., 2013). Based on YRBSS, the NCHRBS questionnaire was developed as a 96-question booklet to assess six HRBs (Dougles *et al*., 2010). The first nationwide survey to assess health risk behaviours among college students in the United States was conducted using the NCHRBS in 1995. The YRBSS contains questions to assess height and weight, physical activity and other health-related issues (i.e., asthma and sleep) (CDC, 2013). Items assessing violence and injuries such as gun violence and substance use such as e-cigarette use were not appropriate for local context. Only a reliability assessment of the 1999 YRBS was carried out to ascertain the psychometric property of this tool which does not ensure the instrument's validity. The reliability of the questionnaire was determined using the test-retest reliability measured over a 14-day period where kappa ranged from 23.6% to 90.5%. There were no significant differences in mean values of kappa by gender, grade, race or ethnicity. Items relating to tobacco, alcohol use and sexual behaviour showed significantly higher reliability (mean kappa >68%) than dietary behaviours (mean kappa=50.0%), physical activity (mean kappa= 55.2%), and other health-related topics (mean kappa=49.7%) (Warren *et al.*, 2002). This study has several limitations as it assessed only test-retest reliability where any inconsistent response in this study was considered to be a response error when calculating kappa and it was carried out only among school students.

National College Health Assessment (NCHA)

The American Collage Health Assessment (ACHA) is a non-profit organization dedicated to improving the health of college students. NCHA was initiated by ACHA in year 2000. The NCHAs contain questions on physical health education, safety, alcohol, smoking, drugs, sexual behaviour and contraceptives, diet, physical activity, physical and mental wellbeing, academic performance, emotional health, sleep, and disability/medical conditions among undergraduates (Hanover, 2013). Presently this is used as a web-based survey with several user-friendly measures including improved view logic and skip patterns that enable students to be bypassed. In order to reduce the stigma associated with mental illness both physical and mental health diagnosis questions were mixed together (ACHA, 2020).

Two pilot trials were carried out in spring 2007 with eight universities (N=8,458) and spring 2008 with seven universities (N=7,681) to determine the validity and reliability of ACHA - NCHA. The Principal Component Analysis (PCA) was used to identify groups of items that are connected and to provide a structure for reliability analysis. PCA was performed separately for each specified domain. The reliability analysis resulted in an average inter-item correlation of 0.52, 0.28 and 0.72 respectively. The construct validity tests indicated that the results are consistent over two sample cycles and across various universities. Overall, the magnitude and trajectory of Kendall's tau-b is consistent (Hanover, 2013). However, all the items in NCHA did not undergo PCA to identify domain structures, instead PCA was performed only for already identified domains individually.

Health Behaviour Index (HBI)

Andrew Steptoe and his colleagues (1991) developed and used HBI to assess HRBs among undergraduate students and to compare it among European countries (Wardle & Steptoe, 1991). Karl Pelzer and Supa Pengpid used this tool in countries of Association of South East Asian Nations (ASEAN), America, Africa, and a few Asian countries like India and Kyrgyzstan (Peltzer, 2000; K. Peltzer & Pengpid, 2015a ; Peltzer & Pengpid, 2014a; Peltzer, Pengpid, and Mohan, 2014; Pengpid, Peltzer, and Mirrakhimov, 2014; Turnbull *et al.*, 2018 ; Wardle & Steptoe, 1991) with few modifications. HBI assess 25 HRBs by assigning a score of 1 to each of the 25 positive health habits and a score of 0 to those who were not followed. These include different aspects of dietary habits, substance use, sexual health, injuries and personal hygiene (Steptoe & Wardle, 1992). Test-retest reliability was assessed among 46 undergraduates who filled out the survey in 17 days. Categorical responses were assessed using Goodman and Kruskal's gamma (G) or lambda (L) statistics as appropriate (L = 0.60-0.96, G = 0.91-0.99, P <0.001 for the various behaviours). Correlations between reports on two occasions were high and significant (r =0.71-0.99, P < 0.001) for hours of sleeping, number of meals and snacks, time since last blood pressure examination, frequency of breast and testicle self-examination, height and weight (Wardle & Steptoe, 1991). Cronbach's coefficients were positive but modest (r= 0.35 for females and r= 0.24 for males), meaning that the wellness activities were very independent (Peltzer *et al*., 2014). However, this tool measures only common risk behaviours of NCDs such as dietary habits, and physical activity and less priority were given for harmful Internet use and unhealthy sleeping behaviour which were more unique among undergraduates.

Validated tools to assess HRBs

Health Behaviour Checklist

The Health Behaviour Checklist (HBC) is made up of 40 items, with 28 of them being used to evaluate four different health behaviours. It has four different domains (HBC). (1) Wellness maintenance and enhancement dimension, (2) Accident control dimension, (3) Traffic risk-taking dimension, and (4) Drug risk-taking dimension. On a five-point Likert scale, 1 = strongly disagree to 5 = strongly accept, participants were asked to rate how well each item represented their normal behaviour. The dimensionality of the health habits was determined using PCA, revealed 2 to 4 dimensions of replicable pattern. Proposed a hierarchical model that indicated there were two general domains. Two particular aspects of fitness management habits and accident control behaviours were included in one broad dimension of preventive health behaviours. The second broad category was risk-taking practices, which included two subcategories: traffic-related risk-taking and the use of potentially hazardous drugs (e.g., alcohol, cigarettes), internal consistency for wellness, maintenance and enhancement domain with 10 items was 0.77, for accident control with six items was 0.65, seven items of risk-taking behaviour was 0.7 and substance use domain with three items was 0.5 (Vickers Jr *et al.*, 1990). Further, for both the confirmatory and exploratory samples, correlations between the 4-factor solutions were between 0.12 and 0.155 which showed substantial factorial stability within samples of male US Navy personnel (Vickers Jr *et al*., 1989)

Health- Promoting Lifestyle Profile (HPLPII)

HPLPII was developed by Walker in 1995 to assess health-promoting behaviours among undergraduates. HPLPII used six domains to quantify health behaviours focused on dimensions of a health-promoting lifestyle: 1) spiritual development 2) interpersonal relations 3) diet and nutrition 4) physical exercise 5) health responsibility and 6) managing stress. A 4-point Likert scale was used to measure the frequency of each action, with 1 denoting "never", 2 denoting "sometimes", 3 denoting "often" and 4 denoting "routinely". When the mean was 2.50, it was deemed a positive answer. Content validity was confirmed by the literature review and expert assessment. A six-factor model of health-promoting lifestyle was confirmed by factor analysis and the Personal Lifestyle Questionnaire (r =.678) was used to determine convergent and divergent validity. Important associations with reported health condition and quality of life (r's =0.269 to 0.491) were used to determine criterion validity. The overall scale's alpha coefficient of internal consistency was 0.943, the subscales' alpha coefficients ranged from 0.793 to 0.872. The total scale had a test-retest reliability coefficient of 0.892 after three weeks (Walker & Hill-Polerecky, 1996). HPLPII has been used in several other countries with cultural adaptations e.g.: Japan, China, Hong Kong, Malaysia, India, and selected Mediterranean countries (Gore *et al*., 2020; Lolokote *et al.*, 2017; Musa, Rabiu, Jessica, Kalsum, Wan, Fatihah, Rashid,Ali, and Rashid *et al*., 2020; Paudel *et al.,* 2019; Suraj & Singh, 2011; Walker *et al*., 1995).

Healthy Lifestyle Scale for University Students (HLSUS)

Based on Pender's Health Promotion Model HLSUS was developed to determine healthy lifestyle practices among undergraduates (Dong *et al.*, 2012). It was a self-administered instrument with eight dimensions: exercise behaviour, routine behaviour, diet behaviour, health risk behaviour, health accountability, social support, stress control and life enjoyment with a total of 38 items. The prevalence of recorded behaviours was measured using a five-point Likert scale: 'never', 'rarely', 'sometimes', 'usually' or 'always' with a ranking score varying from 1 to 5. The cumulative score derived from the scale represented the degree to which healthier lifestyle was practiced. The total score will range between 38 and 190. A higher score indicates that the participant engages in the activities at a higher degree. Its content validity was determined using the Modified Delphi Technique, and its construct validity was determined using exploratory factor analysis which yielded an eight-factor model that clarified 55.02 % of the variance and had eigenvalues >1.00 and reliability was previously determined. For the overall size, the split-half correlation coefficient and Cronbach's a coefficient were 0.841 and 0.892 respectively (Dong *et al.*, 2012). However, this scale measures HRBs as one single domain but not as eight domains.

Domain Specific Risk-Taking Attitude (DOSPERT) scale

Weber and the team in 2002 developed the DOSPERT scale to assess risk-taking attitude among adolescents and youth using 40 items (Weber *et al*., 2002). Risky activities were assessed by eight items on the scale, one for each of the five domains: economy, health/safety, recreational, ethical and social decisions. On the correlation matrix of the 40 risk-behaviour items, Ordinary Least Square (OLS) exploratory factor analysis with oblique target rotation was performed. However, as objects had heavy loadings on several variables, this five-factor hypothesized model was difficult to interpret. The model's factor arrangement of financial products loaded on two variables made the six-factor model easier to understand. Fifty-point three percent of the variance was explained by the six-factor model. Important male–female disparities in perceived

Table 3: List of health risk behaviours identified by literature review

Alcohol, smoking and substance use	Sexual behaviors	Violence and injuries
Alcohol use	Unprotected sex	Self-inflicted injuries
Binge drinking	Multiple sex partners	Carrying weapon, Gun violence
College drinking	Alcohol consumption before sex	Physical fights
Cigarette Smoking	Sexual harassments/abuse	Ragging / bullying/hazing
e-cigarettes	Homosexual relationships	Gang fight
Smokeless cigarettes	Romance, sex and coercion	Intimate partner violence
Substance use	Unsafe abortion	Damaging properties
Illicit drug use	Use of contraception	
Marijuana use	Condom use	
Sniffing glue, aerosol spray cans, inhale paints, Ketamine, poppers	Ever pregnant	**Screen time**
Cocaine (powder, crack, freebase)	Ever had STD	Mobile phone use while driving
Heroin (smack, junk, or china white)	Dating violence	Text while walking
IV drug use	Sexting	While eating
Methamphetamine	Phone and internet sexting	Before sleeping
Ecstasy (MDMA)	Tinder use	Internet addiction
Steroid pills/shots		Electronic media in bed
Prescription drugs		Compulsive cell phone use
Hallucinogenic drugs (LSD, acid, PCP, angel dust, mescaline or mushrooms		Problematic smart phone use
Waterpipe smoking		Video/online games
		Binge watching
		Cyber bullying
		Social networking site scam victimization
		Smart phone use disorder

Mobile phone use	Road safety	Other
While driving	Road traffic injuries, motorcycle crash	Oral care
While eating	Road rage, aggressive driving	Hand washing
Before sleeping	Using mobile phone while driving	Sleeping behavior, insomnia
Internet/smart phone addiction	Driving bicycle without helmet	Exposure to sun
Pathological internet use	Riding car without wearing seat belt	Use of over counter medications/steroids
Problematic smart phone use	Drink and drive	tanning
Sexting	Calling, texting & searching information while riding	Whitening cream use
Cyber victimization	Texting while walking	Undergoing cosmetic surgeries
Cyberbullying	Travelling in foot-board in bus or train	Menstrual hygiene
Nomophobia	Getting into a moving bus	
Social networking scam victimization		
Video gaming		

Mental Health related	Dietary behaviors	Physical activity
Depression	Less fruits & vegetable consumption	Engaging physical activity that increase HR & RR for more than 60 minutes
Sad or hopelessness	High fat diet	Watching TV
Stress	Short eats	Video or computer
Poor coping strategies	High carbs & sugar	Gym/ muscle strengthening exercise
Lack of concentration	Skipping meals/ breakfast	Spots
PTSD	Processed meat consumption	Subjective fatigue
loneliness	Reduced water consumption	Sedentary behavior
Anxiety	Carbonated fizzy drinks	
Suicidal ideation	Sport drink	
Self-esteem	Body image dissatisfaction, body checking	
Procrastination	Bulimia	
Suicidal thoughts, attaempts	Anorexia nervosa	
ADHD	Binge eating	
	Overweight, obesity & BMI	
	Dietary supplement intake	
	Dietary supplements	
	Night eating syndrome	

risk-taking (again, in all contexts except social risk) reflected gender differences in risk assessment with female respondents being less likely to take part in risky activities. The "financial" and "social" subscales had poor test-retest reliability (0.44 and 0.58 respectively). However, health ethics and recreational subscales had respectable test-retest reliability (0.75, 0.72, and 0.80, respectively) (Weber *et al*., 2002).

Multiple short scales or items combined to assess several HRBs

Use of multiple short scales for assessing HRBs is a commonly seen method in literature. Small scales or individual items have been used to measure each risk behaviours in European health and behaviour surveys, where items were chosen from Health and Lifestyle Survey in the United Kingdom and the National Health Interview Survey in the United States (Wardle & Steptoe, 1991).

Similarly, a survey of Australian undergraduate students used several short scales to measure various HRB: The New South Wales Adult Population Health Survey was used to evaluate short diet questions, sitting time and cigarette smoking. The Active Australia study was used to assess physical activity and the Alcohol Use Disorders Identification Test (AUDIT) was used to determine the likelihood of alcohol use and other substance use via Drug Use Disorders Identification Test (DUDIT). Sleeping habits were measured with a single question from the National Centre for Chronic Disease Prevention. Health promotion and psychological distress was measured with the Kessler Psychological Distress Scale (K-10) questionnaire (Hutchesson *et al*., 2021). Apart from these many studies have been conducted around the world to evaluate several HRBs using different scales (Von Ah *et al*., 2004; Jao, Laura, Peter, Christina and Brian, 2019; Keller *et al*., 2008; M. Kwan *et al*., 2016; Peltzer & Pengpid, 2014; Wiehn *et al*., 2018; Ye *et al*., 2016). Although it is convenient to use multiple tools, questioning pattern, response or rating scale inconsistencies and recall period could vary.

Objective measurements to assess HRBs

Objective measurements were used for assessing HRBs in the literature; e.g. biochemical tests for alcohol, nicotine, and other drug use often regarded as the gold standard in confirmation tests because they were thought to be more rigorous and less vulnerable to distortion than other available techniques (Akinci *et al.,* 2001; Caraballo, Giovino, and Pechacek, 2004). Mechanical or computer sensors, such as accelerometers and heart rate monitors; energy consumption, such as doubly labelled water and calorimetry; fitness measures and direct observations were used to accurately determine food intake and physical activity (Weston *et al*., 1997;

Livingston *et al*., 1990). Biological tests like urinary cultures and other investigations were used as objective measures for sexual risk behaviours (Alexander *et al*., 1993; Orr, Fortenburry & Blythe, 1997; Shew *et al*., 1997) and measures of personality and aggression were used to critically quantify violence and accidental injury (Brener *et al*., 2002).

Despite evidence of the widespread importance of HRBs among undergraduates, the researches to date have some gaps and oversights. Different concepts and definitions have been used for development of different instruments to measure HRBs.

DISCUSSION

It is evident that questionnaire-based screening was the most commonly used method for assessing HRBs (Blais & Weber, 2006; Brener *et al*., 2013; Walker & Hill-Polerecky, 1996; Wardle & Steptoe, 1991). Among these questionnaires, some were developed for measuring several HRBs, while others for only one or few HRBs among undergraduates. However, due to cultural diversity, conceptualization of HRBs varies in different countries.

When choosing an already available instrument for assessing HRBs, researchers must be cautious, since the interpretation of HRBs differs greatly across countries and cultures. Furthermore, choosing an already available data collection instrument that meets all study goals is difficult for the researcher since most instruments concentrate on only one or two aspects that the researcher is interested in. They focus more entirely on HRBs rather than the factors that influence certain habits (Brener *et al*., 2013). Validation and the use of several instruments is often a time-consuming process. As a result, many researchers want to create data collection tools that are appropriate for their cultural setting to meet their research objective.

HRB is a sensitive topic involving a substantial amount of stigma to both sexes. Most of the research studies on HRBs were based on self-reporting (Perera & Abeysena, 2018; Fernando, 2019; Somaratna, 2016; Karunathilake, 2016). A self-administered questionnaire would be considered an ideal choice for this study sample considering the high literacy rate. Accurate memory is a prerequisite for accurate self-reporting. Several Key Informant Interviews carried out with experts in the field of public health, sociology and health promotion unanimously accepted that a need of developing a new tool to cover common HRBs to suitable to lower resource setting is important.

Therefore, based on the criteria explained various types of HRBs and tools measuring HRBs were reviewed systematically. The suitability of developing a new tool compared to validating an existing tool was assessed extensively with literature and expert opinion. The limited local evidence available focused mainly on a single HRBs (such as sexual risk behaviour, dating violence, diet, smoking, alcohol, physical activity), and the samples were restricted to few number of universities in a single province or region or limited to one university (Perera & Abeysena, 2018a; Fernando, 2019; Wickramaarachchi, 2013; Gunawardena *et al.*, 2011; Karunathilake, 2016; Chandana *et al*., 2020; Somaratna 2010; Madhavika & Kodithuwakku, 2019; Rajapaksha *et al*., 2013; Sachitra, 2015). It showed the need for conducting a comprehensive and selective common HRB survey among all universities in lower resource setting including Sri Lanka.

Limitations

This review has limitations due to resource constraints and time restrictions, potentially leading to an incomplete representation of pertinent sources and knowledge. Geographic bias may influence the comprehensiveness of the review, resulting in the overrepresentation or underrepresentation of studies from specific regions. The overall quality of the literature review is contingent on the inclusion of individual studies.

CONCLUSION AND RECOMMENDATION

Tools identified from this literature are tailored to specific aspects of HRBs among undergraduates in Western countries, making them unsuitable for a comprehensive assessment of common HRBs among undergraduates in lower resource settings like Sri Lanka. Consequently, it is recommended to allocate sufficient resources to conduct a comprehensive systematic review. A systematic review employs a structured approach to study selection, data extraction, and synthesis, effectively mitigating bias and enhancing the reliability of findings. This approach ensures the identification or development of tools that better align with the cultural and contextual nuances of the target population in Sri Lanka.

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