

## Construction of Knowledge Scale regarding HIV/AIDS

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### Abstract:

**Background:** AIDS (Acquired Immunodeficiency Syndrome) is a life-threatening disease that completely damages the immune system of a human. HIV (Human immunodeficiency virus) is the leading cause of AIDS. AIDS is going to be a terrible problem for our nation in the near future. To prevent the spread of AIDS, every person needs to have proper knowledge about HIV/AIDS and a positive attitude towards HIV/AIDS. The purpose of the study is to construct a standardized tool to assess the Knowledge level regarding HIV/AIDS among undergraduate students.

**Methods:** An item analysis was conducted to construct a standardized knowledge scale (questionnaire) for assessing the knowledge level regarding HIV/AIDS among undergraduate students. A self-administered knowledge scale about HIV/AIDS was applied to 50 undergraduate students in Nadia District, West Bengal, India. Therefore, the difficulty value and discrimination value of each item were calculated to eliminate the poor items. After that, prepared knowledge scale (questionnaire) was administered using a test-retest reliability method between twenty days gap among 60 undergraduate students. The reliability of the questionnaire was justified by Pearson's correlation coefficient between the two test scores.

**Results:** Primarily the tool administered in 41 knowledge items about HIV/AIDS. After item analysis, 12 distracting items are eliminated according to the difficulty index and discrimination index. Therefore, 29 items were selected in the final form of the knowledge tool. Thereafter, the final form of knowledge tool has found significant reliability.

**Conclusion:** The study describes how to construct a standardized tool to assess knowledge about AIDS/HIV that has a good items and significant reliability.

**Keywords:** Knowledge; HIV/AIDS.

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### I. Introduction

Human Immunodeficiency Virus infection/ Acquired Immuno-Deficiency Syndrome (HIV/AIDS) is a disease of human immune system caused by human immune deficiency Virus (Sepkowitz, 2010). HIV/AIDS is a chronic disease that plagues the modern civilization. Its manifestation in the third world country like India are a serious problem. This disease has two aspects primarily the physiological aspect and the other being the social one (Upadhyay, *et al.*, 2010).

A major public health concern caused by HIV and claimed near about 34 million lives globally. It is estimated that, in 2016, 1.0 million people died from HIV related diseases globally. Although, 36.7 million people were living with HIV in 2016 and additional 1.8 million individual were affected with the HIV (Anonymous, 2017; WHO, 2017). As per WHO, in 2020 approximately 410,000 young people from 10-24 years aged were newly infected with the virus, among them 150,000 were adolescents and aged of 10 to 19 years (UNICEF, 2021).

AIDS threatens the very fabric of society. It affects people in their most productive age resulting in several direct and indirect economic costs (Sikder, *et al.*, 2006). AIDS also leave millions of children without parents. These AIDS orphans will swell the ranks of street children, increasing the numbers of young people vulnerable to infection with HIV (WHO, 2000).

Young people(15-24 years old) are of international concern in the HIV/AIDS epidemic and are labelled 'at risk' group. Young women are especially vulnerable to HIV, and they disproportionately account for 64% of the young people living with HIV worldwide (WHO, 2011).

Risk behavior like unprotected sex, multi-partnership, no or inconsistency use of condoms and drug of abuse are extremely determinate to health of adolescents and young adults putting them at high risk to HIV/AIDS and other sexual transmitted diseases (Abede and Fekadu, 2000).

Qualitative and quantitative studies conducted in Ghana showed that the university students are very much susceptible to HIV due to their life style and placing them at high risk group (Anarfi, 2000; Tagoe and Aggor, 2009).

Young people i.e. adolescents used to establish their sexual identities, as a result they are facing with their peers as well as pressures from society (Das, *et. al.*, 20216). For, this reasons adolescents should be aware regarding the changes accordingly at this stages. They should posses the knowledge about symptoms, causes, transmission and prevention about the HIV/AIDS as well as sexual transmitted diseases (STDS).

Since there is no suitable medicine or vaccine against it till now, health education is the only available means to control its spread (Poddar, *et. al.*, 1996). Therefore, it may be necessary to know the basic knowledge, awareness and attitude towards AIDS before any health education programme is launched on a large scale (Mukherjee and Sikdar, 2005).

As a group, undergraduate students are continuously manifested to sexual risk behaviors, during the transition period as freshmen from high school to university or as returning students in college (Fennie and Lass,2014). Students will be more vulnerable to the virus infection due to periodic exposures to sexual behaviors. If not protected and preserve properly from the whip of HIV and AIDS, undergraduate students can acts as a dispersal agents for the propagation of HIV in the Society (Bigala, *et. al.*, 2014). Globally the number of new HIV infections in adults were 6000 per day in 2010 and 42% of them are among young people (15-24 years) [ Tung, *et. al.*, 2008]. Center for Disease Control and Prevention stated that the epicenter of the HIV/AIDS epidemic is college students (Huang, *et. al.*, 2005).

It is evident from various research that increased knowledge about HIV and AIDS can not always ensure positive behavioral change, although behavioral risk change can not be initiated without the knowledge about a disease (Bigala, *et. al.*, 2014; Oladipa, *et. al.*, 2014 and Omoyeni, *et. al.*, 2014).

As there is a dearth of a suitable scale for measurement of HIV/AIDS related knowledge, the main objectives of this work was to prepare and standardization of a knowledge scale regarding HIV/AIDS infection of undergraduate students of Nadia district, West Bengal.

## II. Objective Of The Study

The primary objective of this research work is to analyze the quality of each item of knowledge scale regarding HIV/AIDS and to identify the problematic items so that they can be modified or can be removed from the final scale/questionnaire (Karmakar, *et. al.*, 2021).

## III. Research Questions

This Study is based on three research questions. These questions are-

- a) What are the values of item difficulty and item discrimination of the knowledge scale regarding HIV/AIDS.
- b) How many items are considered as effective items for the final test after analyzing the items on the basis of item difficulty and discrimination values?
- c) Is the test reliable?

## IV. Methodology

**Research design:** Convenient sampling technique has been used for the collection of relevant data in this study. It is a kind of non-probability sampling technique. The non-probability sampling methods are very convenient in the situations when the sample to be selected is very small and the researcher wants to get some idea of the population characteristics in a short time (Koul, 2018).

In the present study, researcher at first selected conveniently all the students from five undergraduate colleges and then randomly selected 50 undergraduate students from those 5 undergraduate colleges.

**Participants:** A structured questionnaire was administered for this investigation to a group of undergraduate students of Nadia district, West Bengal (Wyk, 2006). The researcher administered prepared knowledge scale on 50 undergraduate students for determination of difficulty index and discrimination index of the each items.

**Instrument:** Knowledge questionnaire regarding HIV/AIDS was developed for this study by the researchers. The questionnaire was constructed for assessing the knowledge about HIV/AIDS.

**Item pool for knowledge scale:** The researcher first formed a draft test after reviewing various literature related to the study and consulted with experts and resource persons in the field of research under discussion. The purposes, clarity, language, intensity and appropriateness of each items/statements was examined by the experts and resource person. Thereafter, a set of forty-one items/statements were included in the knowledge

scale/questionnaire regarding HIV/AIDS. The final Items/statements were classified against five dimensions i.e. transmission, prevention & safe-motherhood, prognosis & tendency, recognition & identification, education & socio-economic Status. Special care was taken by the researcher to maintains a consistent balance between the different dimension of the whole Item-pool.

**The scoring technique for knowledge scale:** The forty-one items/statements of the preliminary form in the Knowledge scale regarding HIV/AIDS are of three point Likert types summative rating scale. There was three alternative responses for each statements. The 41 items consisting of fill in the blanks, True (T), False (F) and Don'tKnow (DK), were administered to 50 undergraduate students. The scores '1' for correct response and zero (0) for incorrect response were given .(Rajashekar *et. al.*, 2017).There were sufficient number of favorable and unfavorable items/statements in the knowledge scale of HIV/AIDS. The maximum and minimum scores of the knowledge scale were 41 and 0 respectively. All the forty-one items were spread in all the five dimension of HIV/AIDS as mentioned above.

**Pre-try-out of knowledge scale:** The above preliminary form of the Knowledge Scale was administered on forty undergraduate students of Nadia district. The aim was to find-out the difficulties, if any, faced by the responding individuals in giving response to the individual items in this knowledge scale. The difficulty may arise due to the complexity in the language of the items, or due to unclear or vague statement or even due to multifaced statement demanding more than one response. On the basis of the response from the pre-try-out individuals, further analysis, screening and editing of the statements was done. Opinions of the resource persons and experts were sought to remove ambiguity, if any, and to improve the language of the statements. In this way, every item was checked and modified to make it respondent friendly.

**Try-out of knowledge scale:** When the items have been written down and modified in the light of the suggestions and criticisms given by the experts, the test is said to be ready for its experimental try-out (Singh, 2019). Then the test applied on 50 undergraduate students of Nadia district. The questionnaire was handed over to the student with the instruction to read the questionnaire carefully and then to put their responses in the corresponding boxes against each items/statements. The score of all the items/statements so obtained were summed up as per their relevant weightage. Then the individual scores along with the total scores of all the 50 respondents were subjected for item analysis of each item/statement of the Knowledge Scale of HIV/AIDS.

**Data collection procedure:** At first specific instruction for the test was given by the researcher and then the knowledge questionnaire about HIV/AIDS containing 41 items was administered on 50 undergraduate students from different undergraduate colleges of Nadia district in March, 2022.

**Data analysis:** After scoring the items, the item analysis of the Knowledge scale was done. In item analysis, item difficulty and item discrimination indices are concerned to maintain the psychometric properties of each item. The index of item difficulty was determined by calculating the percentage of the respondents answering an item correctly. Item discrimination was also determined and the test-retest method was followed for the determination of the reliability of the scale. Pearson's Product moment coefficient (r) was used for the determination of the correlation between the scores of two test (test-retest).

## V. Result

**Research question - a:** What are the values of difficulty index and discrimination index of the items of the knowledge scale regarding HIV/AIDS?

**Table 1:** p-value and DI value of the items of knowledge scale regarding HIV/AIDS

Item No.	p-value	DI	Item no.	p-value	DI
K1	0.63	0.45	K22	0.73	0.35
K2	0.63	0.35	K23	0.50	0.30
K3	0.68	0.35	K24	0.60	0.30
K4	0.75	0.40	K25	0.65	0.40
K5	0.75	0.20	K26	0.23	0.05
K6	0.68	0.15	K27	0.63	-0.05
K7	0.55	0.40	K28	0.65	0.30
K8	0.63	0.35	K29	0.40	0.50
K9	0.63	0.15	K30	0.38	0.35
K10	0.43	0.15	K31	0.33	-0.05
K11	0.20	-0.20	K32	0.10	-0.10
K12	0.18	0.05	K33	0.43	0.25
K13	0.53	0.05	K34	0.85	0.30
K14	0.70	0.20	K35	0.70	0.30

K15	0.30	0.40	K36	0.40	0.20
K16	0.88	0.25	K37	0.68	0.25
K17	0.78	0.25	K38	0.83	0.35
K18	0.48	0.35	K39	0.63	0.25
K19	0.28	0.15	K40	0.83	0.05
K20	0.88	0.25	K41	0.50	0.30
K21	0.50	0.30			

**Research question – b:** How many numbers of items are considered as effective items for the final test after analyzing the items statements on the basis of items on the basis of item difficulty values and discrimination values?

**Difficulty value:** Item difficulty were determined by the percentage of respondents that correctly answered the item. Item difficulty value also known as ‘p-value’. The formula of difficulty value:-

$$P = R/N$$

Where,

p = Difficulty value.

R = Number of respondents who answered the item correctly.

N = Total number of Respondents of the item.

Table 2 presents the distribution of items on the basis of difficulty index (p-value) according to general guideline the interpretation the difficulty level (Bichi, 2015).

**Table 2:** Distribution of Items on the basis of difficulty index (p-value)

<i>p-value</i>	Total Item
	Knowledge
Easy(p>0.70)	9
Moderately Difficult(0.31<0.70)	27
Difficult(p<0.30)	5

On the basis of set standards for the interpretation of difficulty indices 27 items of knowledge test were identified as moderately difficult and 9 items were identified as easy and 5 items were identified as difficult. From Table-1, it is clear that in case of knowledge test, 9 easy items & 6 difficult items were unable to satisfy the condition, these items were considered as ‘poor’ items. These ‘poor items were K4, K5, K11, K12, K16, K17, K19, K20, K22, K26, K32, K34, K38 and K40.

**Discrimination value:** Item discrimination is the percentage of difference in the success of an item between high and low scores respondents. It determines the proportion to which an item discriminates the well-known respondents from the poorly known respondents. The discrimination index also known as DI.

The formula of discrimination Value:

$$DI = RU - RL / \text{Number of Upper or Lower group}$$

where, RU = Right responses of Upper Group

RL = Right responses of Lower Group

Upper Group = 27% examinees having highest scores

Lower Group = 27% examinees having Lowest scores

Table 3 presents the distribution of items based on discrimination indices according to general rule to interpret the discrimination (Ebel and Frrisbie, 1991).

**Table 3:** Distribution of Items based on Discrimination Indices.

Discrimination Index	Total Items
	Knowledge
Very Good(D>0.40)	6
Reasonably Good(0.30-0.39)	14
Marginal (0.20-0.29)	9

According to the criteria of the discrimination index, results of the knowledge test indicates that twelve(12) items failed to distinguish between students of different abilities, nine(9) items were marginal which needs to be reviewed, Fourteen(14) items were satisfactory and the function of the six(6) items were very well.

**Selection of items for the final form of knowledge scale:** On the basis of difficulty index and discrimination index (DI), 14 and 12 items of knowledge scale were considered as poor items respectively. On the other hand, six (6) items of knowledge scale (K11, K12, K19, K26, K32, K40) that failed to satisfy the condition based on both difficulty index (p-value) and discrimination index (DI) were eliminated. Among the remaining items, the six items of the knowledge scale, i.e, K6, K9, K10, K13, K27 and K31 having moderate difficulty values of 0.68, 0.63, 0.43, 0.53, 0.63 and 0.33 respectively had the very poor discrimination values of 0.15, 0.15, 0.15, 0.05, -0.05 and -0.05 respectively, therefore although these six items were also excluded/eliminated from the questionnaire. On the other hand, although the eight items of knowledge test, i.e, K4, K5, K16, K17, K20, K22, K34 and K38 having difficulty values of 0.75, 0.75, 0.88, 0.78, 0.88, 0.73, 0.85 and 0.83 respectively but their discrimination values were 0.40, 0.20, 0.25, 0.25, 0.25, 0.35, 0.30 and 0.35 respectively which is reasonably good and very good. According to Varma (2008) item difficulty should not be considered as an indicator for assessing the quality of item, and only DI value of the item should be used to assess item quality. Therefore, these nine items may be included among the questionnaire without any doubt. For this reason, the items viz. K6, K9, K10, K13, K27 and K31 were rejected. And the items viz. K4, K5, K15, K16, K17, K20, K22, K34 and K38 were accepted and only twelve (12) items were eliminated from the final form of the knowledge scale. The details of item analysis of the knowledge scale of HIV/AIDS is presented in the table 4.

**Table 4:** Item analysis of the knowledge scale of HIV/AIDS

Item no.		p-value	DI	Item no.		p-value	DI
Before	After			Before	After		
K1	K1	0.63	0.45	K22	K15	0.73	0.35
K2	K2	0.63	0.35	K23	K16	0.50	0.30
K3	K3	0.68	0.35	K24	K17	0.60	0.30
K4	K4	0.75	0.40	K25	K18	0.65	0.40
K5	K5	0.75	0.20	K26*	-	0.23	0.05
K6*	-	0.68	0.15	K27*	-	0.63	-0.05
K7	K6	0.55	0.40	K28	K19	0.65	0.30
K8	K7	0.63	0.35	K29	K20	0.40	0.50
K9*	-	0.63	0.15	K30	K21	0.38	0.35
K10*	-	0.43	0.15	K31*	-	0.33	-0.05
K11*	-	0.20	-0.20	K32*	-	0.10	-0.10
K12*	-	0.18	0.05	K33	K22	0.43	0.25
K13*	-	0.53	0.05	K34	K23	0.85	0.30
K14	K8	0.70	0.20	K35	K24	0.70	0.30
K15	K9	0.30	0.40	K36	K25	0.40	0.20
K16	K10	0.88	0.25	K37	K26	0.68	0.25
K17	K11	0.78	0.25	K38	K27	0.83	0.35
K18	K12	0.48	0.35	K39	K28	0.63	0.25
K19*	-	0.28	0.15	K40*	-	0.83	0.05
K20	K13	0.88	0.25	K41	K29	0.50	0.30
K21	K14	0.50	0.30				

Note: \*Item Rejected

The final form of the knowledge scale of HIV/AIDS was made on the basis of two criteria, namely- Difficulty value or p-value and Discrimination Index (DI), For both the criteria, preference was given to the

items having medium ranges of p-value and DI values. Because, the items with medium range of p-value are neither difficult to respond, nor too easy to score without proper knowledge.

**Final form of knowledge scale:** The final form of knowledge scale contains 20 items covering all the ten dimension of HIV/AIDS. There were 10 favorable and 10 unfavorable items in the questionnaire (Table 5).

**Table 5:** Distribution of the items among different dimension of knowledge scale of HIV/AIDS

Sl. no.	Dimensions	Item's No. (After item analysis)		Total no. of items
		Favorable	Unfavorable	
1	Transmission	1,3,7	2, 4, 5, 6	7
2	Prevention & Safe-motherhood	8, 10, 11, 13, 15	9, 12, 14, 16	9
3	Prognosis & Tendency	17, 20	18, 19, 21	5
4	Recognition & Identification	22, 23, 24	25	4
5	Education & Socio-economic Status	27, 28, 29	26	4
	<b>Total</b>	<b>16</b>	<b>13</b>	<b>29</b>

**Research question – III:** Is the test reliable?

To determine the reliability of the scale, researcher used the test-retest method. In this study, Pearson’s Product Moment method was used to find out the co-relation between the two tests. The coefficient of correlation between the two tests, i.e., T<sub>1</sub> and T<sub>2</sub> of Knowledge scale was found as 0.83 i.e. highly positive co-relation existed between the two test (T<sub>1</sub> and T<sub>2</sub>) regarding knowledge about HIV/AIDS (Putri, *et.al.* 2019).

**VI. Conclusion**

To conclude, this study has been showed how to construct a standardized tool to assess knowledge about HIV/AIDS that has a good items and significant reliability. The tool is standardized to assess knowledge about HIV/AIDS among the undergraduate students in the demographic area of Nadia district, West Bengal. By this tool, researcher can gather information about knowledge regarding HIV/AIDS of Nadia district’s undergraduate students.

**VII. Implication**

1. This study will help to construct other Knowledge scale for the measurement of various health related issues among undergraduate students.
2. This knowledge scale constructed in this study will help to collect information related to knowledge regarding HIV/AIDS for future research.
3. This study will help to increase social awareness about the adverse effect of HIV/AIDS.
4. This study will help the policymakers to create and implement different policies for the prevention of HIV/AIDS.

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