Collecting Retrospective Data: Developing and Testing the Use of Life Grid for a Life Course Epidemiological Study on Chronic Oral Diseases among Adolescents

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[1*]Kadanakuppe Sushi, [2]Hiremath

[1]*Senior Lecturer, Department of Public Health Dentistry, V. S. Dental College and Hospital, Bengaluru, India-560004.*

[2]*Professor and Head, Department of Public Health Dentistry, The Oxford Dental College and Hospital, Bengaluru, India.*

ABSTRACT

Background: Life grid, a visual tool for mapping important life events along the passage of time is not explored in collecting retrospective data on chronic oral diseases among adolescents. **Aim:** To develop and test the use of life grids for collecting retrospective life-course data on adolescents' chronic oral diseases from a population of adolescents and their parents. It was also aimed to describe the experiences of participants while using life grids. **Methods and Material**: Life grids along with interview schedules were developed and tested for content validity by Lawshe's method using a panel of subject matter experts. A convenience sample of 81 adolescent school children aged 11 years and their parents were selected for testing life grids. Life course retrospective data on behavioral indicators for oral health was collected by using life grids among adolescents. The socioeconomic and biological indicators along the life course of adolescents were collected from their parents using life grids. **Results:** The interview measures showed test-retest reliability of 0.8 and split half reliability for various indicators used in the interview was found to be good. The content validity was quantitatively assessed using Content Validity Ratio (CVR) of Lawshe's method which resulted in retaining the items for which the experts were in agreement that the item is essential to content validity. Life grids proved to be valuable aids in collecting retrospective data as well as elicit the past events more effectively. It helped interviewer and interviewee to engage in a more anchored, relaxed and constructive process to reflect on life course data. **Conclusion**: The use of life grids assisted by interview schedules was found to be reliable and proved to be valid measures to collect life course data among adolescents and their parents

INTRODUCTION

Life course data are rich in retrospective narratives from the participants. Many challenges in methodology of studies using life course approach and analysis of the life course data have been addressed [1, 2]. One of the challenges is improving the recall in retrospective data collection.

Methods to improve recall in retrospective data collection have been proposed by several authors [1, 3]. Life grid is proposed as a reliable method to improve recall in retrospective data collection [3]. The method rests on how best to retrieve our so called autobiographical memory which is involved in remembering past events [4]. All the three main categories of autobiographical memory namely, *event specific knowledge, general events* and *lifetime periods* are involved in retrospective data collection. The simplest way is the use of timelines, where the respondent is asked to record life events on an axis and then place other events accordingly around it. This one-dimensional version has been extended to a life grid or calendar as described by Freedman *et al* 1988, Blane 1996 or Belli 1998[3, 5, 6].

Life grids can be broadly seen as an induced narrative, providing a way of obtaining information on participant's life course. They help in creating a diagrammatic chronology of participant's life. Use of a life grid enables the experiences of illness to be incorporated along the life course.

The idea of a life grid is similar to that of timelines, just in multiple dimensions. When going through a questionnaire, life events are recorded into a large grid, where a set of topics such as children, health, or work are combined with the time dimension, which is usually on the horizontal. The calendar then allows the respondent to see important events in different areas of her life in parallel. Belli argues that the three types of memory mentioned above are triggered by this approach.

Life grids have been used extensively in studies using both quantitative and qualitative interview methods in social sciences [5, 6, 7, 8, 9, 10]. Nevertheless, few life course studies have actually explored the use of life grids in the area of chronic oral diseases, especially among adolescents. This paper proposes that life grids which provide a visual temporal framework to plot the life events [11] may well be used to collect life course data for chronic oral diseases among adolescents.

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The aim of this study was to develop and test reliability and content validity of life grids along with a structured interview schedule for their usefulness in collecting life course data from a population of adolescents and their parents. It was also aimed to describe the experiences of participants while using life grids.

The development and testing of these tools were conducted for a prospective study on assessing the relationship between socio-economic, behavioral, psychosocial and biological indicators with chronic oral diseases among adolescents using a life course approach.

METHODS

Participants and setting: A convenience sample of 81 adolescent students aged 11 years and their parents from a government-aided private school in Bengaluru city, India was selected for the purpose of testing the interview schedules and life grids.

Ethical clearance was obtained for the study by the Ethical Committee of Government Dental College and Research Institute, Bengaluru, India. Research was conducted in full accordance with the World Medical Association Declaration of Helsinki.

Preparation of life grids:

Life grids were prepared in an A3 sheet of paper with columns and rows printed along with years in rows and items to be asked in columns. The use of life grids was assisted by the interview schedule which helps the interviewer during the interview procedure. Life grids were also assisted by the use of external life events. A list of significant external life events such as important festivals, political events etc in the country was prepared which could be used by the interviewer as and when required to help interviewee recall the time period with regard to any particular information asked. The blank outline of the life grids used for adolescents and parents are given in tables 1, 2 and 3.

Preparing an interview schedule:

Initially, interview schedule was devised based on the suggested six steps by WHO, to cover the questions to be asked in structured interviewing [12]. The term, interview schedule can be employed to refer to a structured list of issues to be addressed or questions to be asked in structured interviewing [13]. The questions included were majority close ended with some open ended questions where the need to know the subjective view of the interviewee was felt.

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For the final draft of the interview schedule, general guidelines for item placement was followed as given by Siniscalco MT and Auriat N [14]. The final draft of the interview schedule hence was composed of the following sections: Socio-demographic indicators, psychosocial indicators, behavioral indicators and utilization of oral health services for adolescents; and socioeconomic status, biological indicators and social support in adulthood (for mother) for parents. Language translation expert at Comparative Literature and Translation Studies, Kuvempu Institute of Kannada Studies, University of Mysore, Manasagangotri, Karnataka was utilized for the process of translating the English questionnaire into local language (Kannada) and back translation into the language of the original text was done.

The interview procedure: The structured interview was conducted by the investigator on the selected sample in the school in a separate quite classroom. Separate interviews were conducted with parents on a scheduled day at the school. Written informed consent was obtained from both adolescents and parents before the interview.

The participants were also asked about the acceptability of the interview procedure with life grids, any difficulty in understanding the questions asked or convenience in using life grids to assist recalling the information of the past. Twenty adolescents and their parents were invited to take the interview again after a week for assessing test-retest reliability. The information from the life grids was quantified by coding the items under pre-decided categories of themes of behavioral, biological and socioeconomic indicators of the interview schedule.

Statistical analysis:

The data collected was put in a database created with Excel and analyzed with SPSS 19 for Windows. The analysis was made only on the items with a response level higher than 15%. The level of significance was fixed in $p < 0.05$.

The descriptive analysis used averages and standard deviations for quantitative variables and frequencies for qualitative variables. To measure the internal coherence of the items grouping the α of Cronbach has been used and, in order to check if some elements didn't cohere with the rest of the scale and should, therefore, be discarded, an analysis of reliability has been performed. Adding and eliminating the elements one by one created the total correlation between the items and the alpha variability between the elements. When Cronbach's alpha is

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equal to 1 it means that the questions have an almost identical construct, with consequential coherence. Generally, a value of an alpha of 0.7 is considered acceptable.

Examining content validity of the interview schedules

For content validity using judgments from a panel of subject matter experts (SMEs), Lawshe's method was used [15]. Totally fifteen panelists were identified since validity of the interview schedule can be judged more effectively if more than ten panelists were to return the schedules [15] (Table 4).

Quantifying consensus among SMEs

For this research study, a Content Validity Ratio (CVR) value of 0.49 was considered to be the minimum acceptable value according to Lawshe table to retain an item/question judged by 15 SMEs (Table 5).

RESULTS

Reliability: The intra-interviewer reliability was assessed by test-retest reliability. The correlation coefficient for test-retest reliability was 0.8. The reliability of structured interview for students and parents by sections is shown in Table 6.

Result for content validity: According to Lawshe table for 15 SMEs, it was decided to accept the items unconditionally if CVR value of 0.49 or greater is obtained. The results were considered to finalize the items in the questionnaire.

Use of secondary data to cross check the validity of interview schedules and life grids: cross checking the information collected with the secondary data such as hospital records, school records and teacher's dairy showed fairly accurate recording of information on exposure/risk factor/ events by the use of interview schedules and life grids.

Interview acceptability: Parents who used life grids in the interview process were comfortable in recalling information and were satisfied with their answers. They expressed a sense of rapport with the interviewer in the process. Almost all mothers felt comfortable to answer the questions during the interview except for three mothers who felt difficulty in using the calendar type life grids which they felt was restricting their memory to the years

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mentioned on the grid. Adolescent students were keen to provide information and felt comfortable in the process.

DISCUSSION

The study designs used for life course approaches such as historical cohort studies, case-control studies and combination of retrospective and prospective designs suffer from high risk of recall bias. However, most of the studies done using life course approaches are cross-sectional in nature, which give less accurate time sequence of exposure and outcome events, as well as subject to recall bias [16, 17, 18]. Alternative interview techniques such as use of life grids are suggested in order to minimize recall bias.

Life grids were originally used in health research to minimize recall bias in the reporting of health histories [3]. They were initially developed to assist recall of older respondents in quantitative, health-related issues [3, 19] and later also employed with older respondents in qualitative research [20]. The present paper assessed the use of life grids for a prospective cohort study design to examine a life course model of chronic oral diseases among a population of adolescents and their parents.

Using life grids with adolescents and their parents

To minimize recall errors life grids were used to collect recall data on past events pertaining to biological indicators, socioeconomic status and social support of the parents of adolescents. They were also used with adolescents to collect recall data on behavioral indicators. In both instances, the interviewer was assisted by the interview schedules during the process of using life grids.

The mechanism of memory retrieval works on a threefold structure of top-down, sequential and parallel retrieval. These advantages have been used in this survey during life grid interviewing. The list of external life events was used by the interviewer to help interviewee recall the time period with regard to any particular information asked. This was based on the concept of 'temporal landmarks' which hinges on the idea that there are certain events in one's life that are outstanding- personal events like birth of a child or public events such as the win of one's national cricket team in world cup series. These external life events can be used to anchor the respondents' memory and place other personal events relatively to that landmark.

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Life grids only acted to assist participants in easy recall of the information asked. Participants who could not remember particular date for adverse events such as episodes of childhood infectious disease or the history of hospitalization of the child, the external life events such as important social events like festivals or political changes in the state which happened during the same year were presented by the interviewer to help parents associate the date or duration of events.

Collecting biographical narratives on behavioral indicators with adolescents using life grids

While using life grids with adolescents, it helped bring a friendly non-threatening atmosphere for the respondents. The task of completing a calendar like life grid aroused interest in the child to take the process of recollecting past events more seriously. Life grid was used with adolescents to elicit past events related to behavioral aspects such as deleterious habits of using tobacco or alcohol, dietary habits like eating sugary foods, pocket money spent on confectionery and oral hygiene practices. Life grids with its graphical representation amused adolescent students and quickly put the interviewer and interviewee at ease. Adolescents' interest was focused on the grid given to them to complete rather than on the interviewer which happens in conventional interviewing techniques. This did not put the interviewer as the authoritarian figure in the interview and hence the process proceeded naturally with adolescents actively participating and interviewer intervening only to ask specific questions or cueing when required.

Eliciting sensitive issues from adolescents was greatly made easy with life grids. For example, sensitive issues recounted by some adolescents were the use of tobacco either in the form of beedi or cigarettes. Only a very few adolescents could actually reveal this habit in the past. Even though tobacco was tried only as an experiment or out of curiosity by adolescents, the related factors responsible for these events were reflected with the aid of life grid:

I: *Did you ever smoke?*

R: *Oh No! I never smoked… (pause)... my dad smokes, though.*

I: *So what do you think of that?!*

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R: *My teacher says its bad for health. But it attracted me and some famous film stars smoke too….. So, you know even I just tried once, like, I just acted like smoking, giving poses with a cigarette. But it tasted bad and I was coughing so I threw it away. I never told anyone.*

I: *Oh! When was this?*

R: *I think it was when I had summer holidays last year or before last year, can't remember. Not at my house, though…. I had been to cousin's place in town.*

I: *Okay... Was it the same year when you started brushing your teeth twice? You told me before that it was your cousin who influenced you to brush twice a day. Look where you have marked on the grid... it comes on year 2009.*

R: *Oh yeah! That's right (smile)... He brushes twice a day because his mom brushes twice a day... so I started brushing with him. But I never told him that I tried a cigarette, he doesn't know.*

I: *Okay... How did you procure it?*

R: *With my pocket money… my dad gives me 20 rupees every day!*

The questions on whether adolescents received pocket money, peer influence, oral hygiene practices such as frequency of brushing were already present in the interview schedule to aid life grid. Nevertheless, as shown in the above example, different aspects of behavioral indicators were narrated by that adolescent in his own natural flow of storytelling without the need of interviewer asking all of those specific questions. One event of spending summer holiday with a cousin at town revealed several aspects of his acquiring the habit of brushing his teeth twice daily as well as trying to smoke a cigarette out of curiosity. It also showed how parental role modeling in acquiring an oral hygiene practice or deleterious habits like smoking can be effectively spread to the progeny. Such information is important for assessing chronic oral diseases such as dental caries. Life grid helped bring these events together with respect to time periods very effectively.

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Collecting biographical narratives on biological and socioeconomic indicators with adolescents' parents using life grids

Life grids proved to be effective tools in retrieving retrospective data on biological and socioeconomic indicators from adolescents' parents. These were the parents of 11 year old adolescents and hence retrieval of information since the birth of the child till 11 years was sought. The life grid helped the parents to recollect information regarding biological events such as type of delivery, time period for weaning of breastfeeding, any deviations in the milestones of their child, any childhood infectious disease for which hospitalization of the child was required and events of alcohol consumption during pregnancy or second hand smoking from partner during pregnancy. Recollection of these events with respect to time over the past 11 years of their lives was made easy with the help of life grids which provided the respondents a visual or graphical representation of their life history.

The experience of using life grids showed that parents were steered into a form of storytelling since a visual framework of their life history start forming as they complete the life grid. The parents also felt responsible for providing accurate information for their active participation in completing the life grids was involved. The mutual participation from both interviewer and the respondent kept the interviewing atmosphere lively and comfortable. This resulted in more anchored and relaxed procedures of collecting recall data.

The parents could recognize the potential of life grids especially while reflecting on the life history constructed by them on the grid. For example one parent (mother) first tried to recall an event asked such as when was your child weaned from breastfeeding and once recalled could reflect on the difficulties faced during weaning. This led the respondent to continue the storytelling of how sugar used in the weaned food helped and how the child started getting used to sugary foods. She also reflected on her difficulties to induce interest in the child to eat food such as boiled vegetables:

I: *And when did you start weaning your child from breastfeeding?*

R: *Mmm... I think it was around when she was 1 year old, can't remember exactly.*

I: *Was it when the doctor asked you to wean?*

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R: *Oh, No! My mother said it is about time and yeah I think it was at Sankranti festival at my mother's place when my mom told me. My child's birthday is just around that festival! So it was at 1 year, yes!*

I: *Okay...*

R: *And you know it was not easy to wean her from breastfeeding. I had to start adding sugar to make her drink milk or supplement food. I think that's why she started liking sweet items so much. She used to grumble while eating boiled vegetables. I need to give her some sweet even now if she starts making trouble eating dinner!*

Sugar in weaned food is shown to be significantly associated with dental caries experience in children. Although sugar in weaned food was one of the questions to be asked, the interviewer had no occasion to ask since the respondent herself started providing information in her narrative centered on that topic. Life event marked around that topic made recollecting other related events more naturally and made it easy to locate time periods. The visual framework of life grids also helped respondents to cross-check the events to correct errors.

The history of socioeconomic status (SES) of the family such as changes in occupation, house tenure, and vehicle and toilet facility across the time period of 11 years since the birth of the child was also interviewed using life grids. This participatory approach helped the interviewer to assist the interviewee to recollect SES information needed as life grids provided a more graphical outline of life events in the form of a chart laid in front of the parents.

Life grids helped both adolescents and their parents to construct their autobiographical events in a clear and comfortable manner. This resulted in more accurate recall of events in the past which is crucial for assessing a life course model. The recall data on the temporal sequence of exposures along the life course of an adolescent is required to assess its impact on chronic oral diseases. Such recall data were obtained both from adolescents themselves as well as through their parents on biological, socio-economical and behavioral exposures on adolescents using life grids. The interview schedules were effectively used to assist interviewers in using life grids.

The present work has developed a methodological approach to collect life course data through the use of reliable and valid interview schedules. The use of life grids to enhance the

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recollection process of life histories on biological and socioeconomic status of the family was also tested for acceptability and ease of use and found to be effective. Such an approach to collect life course data will strengthen the prospective study designs suitable for testing life course models among adolescents.

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Competing interest:

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Table 1: Life Grid For Adolescents: Behavioral Indicators

Year	Age	Oral hygiene practices	Tobacco chewing/Smoking	Alcohol consumption	Oral habits	Dietary habits	Use of fluoride
2001							
2002							
2003							
2004							
2005							
2006							
2007							
2008							
2009							
2010							
2011							

Table 2. Life Grid for Parents: Socio-Economic Indicators

Year	Occupation	Family income (monthly HH spending & on confectionary)	House material	Water source	House tenure	Family members (overcrowding/ Floor space)	Toilet facility	Vehicle ownership (Type)	Social support in adulthood 'Is there someone in particular in your life that you think would listen to you and give you emotional support if you needed it?'
2001									
2002									
2003									
2004									
2005									
2006									
2007									
2008									
2009									
2010									
2011									

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Table 3. Life Grid for Parents: Biological Indicators

Year	Age	Life events	Health during pregnancy	Birth order & Birth weight of the child	Type of delivery	Feeding practices	Milestones of the child	Age at which schooling started? (Record age at which the first school such as play home for which the child was admitted)	History of hospitalization/Childhood infectious disease	Smoking habit/ passive smoking from the partner	Alcohol consumption
2001											
2002											
2003											
2004											
2005											
2006											
2007											
2008											
2009											
2010											
2011											

Table 4. Composition of the panel of Subject Matter Experts

Category	Number	Doctorate	Masters	Average years of experience
Psychiatry	3	1	2	11
Pediatrics	3	Nil	3	12
Dietetics	1	1	-	20
Gynecology	3	Nil	3	16
Public Health Dentistry	2	Nil	2	14
Community Medicine	1	Nil	1	14
Sociology	2	1	1	18
Total	**15**	**3**	**12**	**15**

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Table 5. Minimum values of CVR and CVRt for different numbers of panelists.

Number of Panelists	Minimum Acceptable CVR value
5	0.99
6	0.99
7	0.99
8	0.75
9	0.78
10	0.62
11	0.59
12	0.56
13	0.54
14	0.51
15	0.49
20	0.42
25	0.37
30	0.33
35	0.31
40	0.29

One tailed test, p=0.05 (Lawshe, 1965)

Table 6: Reliability (Split half) and Cronbach`s alpha

Scales	Reliability (Split half)	Cronbach`s alpha
Psycho Social Indicators	0.831	0.846
Problem-solving and decision-making	0.824	0.826
Coping strategy scale	0.800	0.790
Paternal & Maternal levels of support and punishment scale	0.831	0.835
Behavioral indicators	0.890	0.889
Utilization of oral health services	0.878	0.838
Parents interview schedule	0.822	0.824

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