Brief Reports

Validation of Revised Prescreening Denver Questionnaire in Preschool Children of Urban Slums

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A large proportion of preschool children in India, as in other developing countries, live in the urban slums. Among them, early identification of developmental delay will be beneficial. In the developed countries, rapid prescreening Denver Questionnaire (R-PDQ) is currently being used for community screening of developmental delay. This is followed by administering the Denver Development Screening Test (DDST) if necessary (l, 2). We set out to validate R-PDQ among the preschool children living in the urban slums (Anganwadi Centers) covered by the Integrated Child Development Services in Lucknow, North India.

Subjects and Methods

The study was carried out in 32 randomly selected Anganwadi centers of urban Lucknow. There are four R-PDQ questionnaires, one each for the following age groups: 0 to 9 months, 9 to 24 months, 2 to 4 years and 4 to 6 years. Each questionnaire tests 4 specific domains of development: gross motor (GM), fine motor activity (FMA), personal-social (PS) and language (L). The person keeps answering the questions till there are three negative responses. Questionnaire for age 2 to 4 years was translated into Hindi, and pilot tested for understandability.

Study subjects were between 2 to 4 years of age. All eligible children living in the 32 Anganwadi centers were enrolled with parental consent. Since most of the mothers were illiterate, R-PDQ was administered by trained research staff. Literate mothers were encouraged to self-administer R-PDQ. Subjects were allocated random numbers and rank ordered. Every sixth child was administered DDST in the community setup.

R-PDQ was just administered once. DDST was administered once after the R-PDQ screening in randomly selected children. If the results of the first DDST were either suspicious or not testable, according to the criteria laid down in the manual (3), DDST was administered once more. The time taken for administering R-PDQ and DDST was noted for 10 children. Four persons were involved in administering R-PDQ and the fifth person, the co-author (VKP), gave DDST in the community (Anganwadi centers). The co-author was blind to R-PDQ results.

We tested for inter-observer variation in R-PDQ scoring. In other situations inter-observer variation is tested by making different persons do the same test on one subject. For a questionnaire this is not the correct strategy as each interview is a learn-

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ing experience and subsequent responses are expected to be different. Therefore, to test for inter-observer variation for R-PDQ screening we have compared the proportions of children identified with no delay, one or more and two or more delays by the 4 project officers by using the chi-square test. A 2 tailed p value of > 0.1 was considered as indicative of statistically significant inter-observer variation.

To validate R-PDQ, we cross tabulated it with DDST results. We calculated the sensitivity (co-positivity), specificity (co-negativity) and referrals, with 95% confidence intervals, for various cutoffs of R-PDQ results. We have used the terms co-positivity and co-negativity interchangably with sensitivity and specificity, respectively. This has been done because DDST is not a gold standard for diagnosing developmental delay and we are just comparing two screening tests with each other. We also calculated the proportion of children who passed each item within the 4 specific domains of testing. Within each domain, if ≥ 75% of the mothers reported that her child could not pass an item, this was considered as a possibly "difficult to interpret" question.

R-PDQ has questions pertaining to specific items tested in DDST. We calculated the 90th percentile of age at which the mother reported that her child could pass a specific item.

Results

R-PDQ was given to 811 children. DDST was given once to 126 children and a second time to 20. The average time taken for administering R-PDQ was 19.73 minutes and DDST was 22 minutes. R-PDQ had to be read out to all the respondents.

There was no inter-observer variation in R-PDQ scoring (p value=0.12). No delay in R-PDQ was found in 245 (31.3%; 95% CI: 28.2-34.6%), one or more delay in 557 children (69.4%; 95% CI: 66.1-72.5%); two or more delays in 501 (62.5%; 95% CI: 58.9-65.7%), while the rest had no delay. Abnormal DDST results were found in 8.7% (95% CI: 4.7-14.7%).

R-PDQ was validated against DDST at two cutoffs *(Table I).* If we considered children with 1 or more delay in R-PDQ as candidates for second stage screening with DDST, then we would be referring 92.9% of them *(Table I).* The benefits of two stage screening are thus lost. At this cutoff of R-PDQ, there were 11 children with a not normal/questionable DDST result. Thus, the sensitivity or co-positivity of R-PDQ at this cutoff was 100%. However, of 106 children with a normal DDST result, only 9 had no delays in R-PDQ testing. This gave a low specificity or co-negativity of 7.8%. Now, if we consider referring children with 2 or more delays on R-PDQ for second stage screening with DDST the number of referrals will be reduced to 53.9%. But a cutoff of 2 or more delays in R-PDQ has a low sensitivity or co-positivity as well as a low specificity or co-negativity and thus cannot be used for screening.

In *Table II,* we have shown the 90th percentile of age for passing an item on DDST (reference age) as shown in the chart. Side by side we have given the 90th percentile of the age for when a mother reported that her child could perform a test during R-PDQ screening in Lucknow. The questions that were possibly "difficult to interpret" have been marked by an asterisk.

Discussion

When R-PDQ was validated among children from the lower socio-economic status in the United States, approximately one-fourth were referred for further developmental screening(l). This referral rate

TABLE I-*Comparison of Children's Performance on R-PDQ with DDST, Using DDST as the Standard.*

	DDST			
	Not Normal/ Questionable	Normal	Total test characteristics (95% confidence interval)	
R-PDQ Delays				
≥1	11	106	117	Sensitivity: 100% (76.2-100%)
0	0	9	9	Specificity: 7.8% (3.9-13.9%)
				Referrals: 92.9% (87.3-96.5%)
	11	115	126	
≥2	2	66	68	Sensitivity: 18.2% (3.2-38.3%)
≤1	9	49	58	Specificity: 42.6% (33.8-51.8%)
	--	--	--	Referrals: 53.9% (45.2-62.5%)
	11	115	126	

from US is lower than that observed with R-PDQ in Lucknow slums. Here on using a cutoff of 2 or more delays on R-PDQ for referral, 53.9% of children would be eligible for further screening for developmental delay. With DDST, the referral rate in US was 12.9%(1) and this is within the 95% confidence interval of 4.7-14.7% observed in Lucknow slums.

R-PDQ had to be read out to all the mothers here. Thus, a child's scoring on R-PDQ was entirely dependent upon the mother's understanding of the question, communicating skills of the staff, parental awareness of various childhood developmental milestones and activities as well as cultural influences. It appears that mothers belonging to the lower socio-economic stratum had difficulty in understanding questions in all the four test domains, but more so for personal-social and language assessment of their children. For example, we know by experience that most mothers in Indian slums will not tell the names of their husbands or do not have a specific last name. Therefore, they could not understand the question in R-PDQ where they were asked whether the child could tell his or her first and last name. Clearly, such a question is not appropriate for the Indian setup. Likewise, in the gross motor category, the question on whether the child can "pedal a tricycle" cannot be answered reliably since most families in the slums do not possess a tricycle.

If we exclude questions that were possibly "difficult to interpret" we still find that the 90th percentile age of passing an item here, as assessed by R-PDQ is delayed when compared to the reference age printed in the DDST chart. The possible explanation for this may be that even though the

TABLE II— *Comparison of Observed 90th PercentileAge of Passing Various Items, by Self Reporting of Mothers on R-PDQ Testing, with Reference DDST Standards.*

Item category	Self reporting by the mothers	
	Reference	Observed
I. Language		
1. Combine 2 different words	2y-3m	2y
2. Name 1 picture	2y-6m	2y-3m
3. Follows direction*	2y-8m	3y-ll
4. Uses pleurals	3y-2m	3y-4
5. Gives first and last names*	3y-9m	> 4y
II. Personal-Social		
1. Uses spoon, spilling little	23m-2wk	18m
2. Helps in house-simple tasks	23m-2wk	26m
3. Puts on clothing*	3y	> 4y
4. Washes and dries hands	3y	> 4y
5. Plays interactive games*	3y-6m	> 4y
6. Dresses with supervision*	3y-6m	> 4y
III. Gross motor		
1. Kicks ball forward	2y	2y-2m
2. Throws ball overhead	2y-7m	2y
3. Jumps in place	3y	> 4
4. Pedals tricycle*	3y	> 4y
5. Balance on 1 foot	3y-2m	3y-8m
6. Broad Jump	3y-2m	> 4y
IV. Five motor activity		
1. Dumps raisin from bottle	2y	2y-2m
2. Scribbles spontaneously	2y-lm	2y-6m
3. Tower of 4 cubes	2y-2m	2y-6m
4. Dumps raisin spontaneously	3y	3y-6m
5. Imitates vertical line within 30°*	3y	> 4y
6. Copies circle*	3y-3m	> 4y
7. Imitates bridges*	3y-4m	> 4y
8. Tower of 8 cubes	3y-4m	> 4y

* This indicates those questions that were possibly "difficult to interpret".
Y=age in years; m=age in months; wk=age in weeks.

mothers understand the question they never had the opportunity or the desire to give such tasks to their children. For exam-pie, one would not expect illiterate mothers to encourage their children to write at home. Therefore, even though a child may be able to make circles or draw straight lines the mother would not be aware of it. This led to the observation that those children who were classified as delayed on

specific R-PDQ items subsequently passed these when made to perform in front of the investigator in the DDST. Cultural variations have been reported to increase referrals even with DDST (4). In the urban slums of Lucknow, the referrals with DDST were 8.7% (95% CI: 4.7-14.7%).

We conclude that since R-PDQ had questions that were possibly "difficult to interpret", had high referral rates for further screening for developmental delays and had bad correlation with DDST test it cannot be used as a first stage screening for developmental delay in the urban slums of Lucknow, India. Similar studies are needed from other parts of the country and on children belonging to different socio-economic strata before the results can be generalized. DDST may be considered for community screening for the urban slums here and in places with high levels of maternal illiteracy.

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Tobacco Use in Rural Indian Children

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Tobacco-related disease kills an estimated half million people a year in India (l). Most adult addicts to tobacco start young. Data on tobacco use by rural children or youth in India (2-4) are few and only recently available (5). This pilot survey assessed the degree, nature and pattern of tobacco use by children in rural areas and the need for a larger study.

Subjects and Methods

A Tamil, Gujarati or Kannada transla-

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