

# SCIENTOMETRIC PORTRAIT OF VINODINI REDDY

V.L. KALYANE  
S.V. KALYANE

*In this paper research publications of Dr. Vinodini Reddy, considered to be a successful role model medical scientist, have been analysed quantitatively by year, authorship pattern, collaboration coefficient, collaborators, journalwise contributions and key works from titles of the articles published etc. The study may be of interest of all those interested in evaluating research communication performance of departments in Universities, institutions, industries, R&D laboratories and science policy makers.*

## **Key Words:**

*Bibliometrics, Scientometrics, Collaboration, Publication density, Publication concentration, Research group interaction, History of science, Sociology of science.*

## **Introduction**

Dr. Vinodini Reddy is the Director of the National Institute of Nutrition (NIN), Hyderabad, which is one of the leading food and nutrition centres in S.E. Asia. She is an outstanding medical scientist with vast experience in the field of public health and nutrition. Dr. Reddy has carried out extensive research on protein energy malnutrition, nutritional anaemia, vitamin A deficiency and blindness, which constitute major nutrition problems in developing countries.

Her studies on protein energy malnutrition highlighted the importance of calories in the treatment and prevention of the condition. Several low cost nutritious recipes have been evolved, based on locally available foods, which are being used in the National Nutrition Programmes. Recognising her contributions in this field, she has been elected as Chairman of the IUNS (International Union of Nutrition Sciences) Committee on Protein Energy Malnutrition. She has carried out pioneering work on vitamin A deficiency, which is a major public health problem in India and an important cause of blindness in children. Her studies on the use of massive dose of vitamin

---

*Mr. VENKAT LAKSHMAN RAO KALYANE, a gold medalist and recognised research fellow from American Bibliographical Institute USA, is at present serving in the Directorate of Oilseeds Research, Rajendranagar, Hyderabad - 500 030  
Ms S.V. KALYANE is working at Turning Point Centre, Belapur, N. Bombay - 400 614*

A has led to the prevention of nutritional blindness. She has contributed significantly to maternal and child nutrition, particularly on maternal anaemia, breast feeding, weaning foods, and represented India at the WHO/UNICEF meeting on International Code of Marketing Breast Milk Substitute at Geneva. Her studies on lactose intolerance have received international recognition. She was a Member of the Protein Advisory Group on 'Milk Intolerance and Nutrition Implications', and the recommendations of the U.N. Body, on the use of milk as a protein supplement for undernourished children was based mostly on her studies. As the Director of National Nutrition Monitoring Bureau, she is involved in planning and supervising food consumption and nutrition surveys in different parts of the country.

Her outstanding work in the area of human nutrition has been recognised by a number of awards and honours. The national awards include P.N. Raju Award (1978); Kamala Menon Medical Research Award (1981); Chatterjee Gold Medal (1988); Basanthi Devi Amir Chand Prize (1991); B.C. Roy Award (1992) and Dr. Siva Reddy Gold Medal (1992). Her work has also attained international recognition. She received Friesland Award, a coveted world prize in 1973 from Netherlands Association of Dairy Sciences, and Cottee's General Foods Oration Award (1982) from the Deakin University, Australia.

In recognition of her outstanding scientific contributions, she has been elected as a Fellow of the Indian Academy of Pediatrics in 1984; Andhra Pradesh Science Akademi in 1989 and National Academy of Medical Sciences in 1990. She is a Member of the IUNS Council (International Union of Nutritional Sciences) and Steering Committee of IVACC (International Vitamin A Consultative Group), the only representative from India.

#### Scientometric Analysis

The present study considers the broad spectrum of expertise of Vinodini Reddy a worthy subject for in-depth micro analysis of her publications productivity (1) because

an important end product of scientific research is the publication of paper. It may work as a standard model. Knowledge is valuable for its own sake and research has cultural value. Desire of being creative is built in our genes. Who knows this effort may switch on genes for creativity in some of those who happen to read this article. Narrating success stories always has an encouraging effect. A contest for world leadership in science and technology exists. New ways to motivate scientists seems as important to contest outcome as new sources of funds. (2) Most of the developing countries lack local 'role models' to motivate other scientists. (3) Genderwise participation in research at Sugarcane Breeding Institute, Coimbatore was carried out in order to particularly focus on the participation of women in agricultural research, wishing the outcome would sensitize, encourage and create consciousness among young women to confidently undertake research without any hesitation, enabling themselves to share responsibilities with men equally in the 21st century. (4) Science policy makers are also interested in knowing about functioning of active research teams and factors responsible for optimizing, maximizing an enhancing outputs. Policy makers can react by creating better facilities for the younger generation to tap their creative potentials in time.

The number of publications serves as the Scientometric Indicator of the latent "Scientific Productivity". (5) Scientometrics is a subfield which applies quantitative methods to the study of science as an information process in the historical perspective of sociology of knowledge. In this information model, publications are the carriers of information, journals are the communication channels, and bibliographical references represent a special language of scientific information which shows the impact of previous research on the development of information flows. Scientific indicators may deal with individual scientist to a major science field as a whole. (6)

#### Methodology

All papers of Vinodini Reddy were considered and

"Normal count" procedure (7) was followed. Full credit was given to each author regardless of who happens to be the first or the last author. From the personal point of view, there is no doubt that scientists all over the world, look at their own papers exclusively in such a way. Similarly, titles of the articles were analysed and one score was allotted for each key word.

The degree of collaboration (8) in a discipline was defined as the ratio of the number of collaborative research papers to the total number of research papers published in the discipline during a certain period of time.

Vinkler (9) defined publication density as number of papers published per number of journals used; and publication concentration as number of journals containing half of the papers published times 100 per total number of journals used; during the period under study.

### Results and Discussion

Vinodini Reddy has published 141 research papers out of which single authorship papers were 41 and multi-authorship papers were 100 during 1960-1993 (Table 1). She had main authorship in 74 papers and she was co-author in 67 papers. The two authorship papers were 53 where she had first authorship in 21 papers and second authorship in 32 papers. The three authorship papers were 29 where she had first and second authorship in six papers each and third authorship in 17 papers. Four authorship papers were ten, where she had first authorship and fourth authorship in three papers each, and second and third authorship in two papers each. Five authorship papers were six where she had second authorship position in two each, and fourth and fifth authorship in one paper each. Seven authorship papers were two only during 1986, where she had first and seventh authorship respectively.

Her first publication was in 1960 at the age of 26 years. She had peak productivity of twelve papers during 1978, at the age of 44, where three papers were single authored, five papers were having two authorships, three

papers had three authorship and one paper had four authors. Out of ten papers published during 1986, at the age of 52, where two papers were single authored, one paper was two authored, four papers were three authored, one paper was four authored, one paper was five authored and two papers were seven authored. Out of nine papers published in 1982 three papers were single authored, five papers were two authored and one paper was having three authors.

It is interesting to find that more or less equal proportion of papers were as main author and as co-author during the five year periods of 1960-65, 1965-70, 1971-75, 1976-80, 1981-85, and 1986-90, which is a healthy trend.

Collaboration coefficient was one during 1960 & 63, 1965-68, 1970, 1974, 1976, 1989 & 90 and 1993. Collaboration coefficients between 0.75-0.80 were found during 1964, 1972, 1977-79, 1983-84, and 1986. Overall period collaboration co-efficient was 0.71 which is a healthy sign of research collaboration team.

First fifty percent of papers were published during nineteen years (1960-78), next fifty percent of papers were published during fifteen years (1979-93). The general finding was that scientist publish most frequently during their fourth decade of life (10, 11, 12, 13) and thereafter publication rate drops. She has followed almost same trend accepted at international level.

Graphic presentation of the data is given in Fig.1. Extended S type curve was obtained for cumulative total papers. Single authored papers and multi-authored papers give fluctuating trend as expected of any active research group.

Research collaboration group of Vinodini Reddy (Table 2) consisted of 67 collaborators. M. Mohan Ram was the strong collaborator with 17 papers. Out of this six papers were two authored and eleven papers were three authored. S.G. Srikantia has published 14 papers in collaboration

with her. Twelve papers each were published by P. Bhaskaran and N. Raghuramulu in collaboration with her. Total authorships were 318. The 73 percent authorships were with the group of nine collaborators where Vinodini Reddy had share of 44 percent authorships. Whereas remaining 27 percent authorships were distributed among 58 collaborators.

Information on author productivity is provided in Table 3. Single paper collaborators were 38, two paper collaborators were 13, three paper collaborators were seven. This group forms low collaboration activity group of top ten had 233 authorships.

The journals (Table 4) where she had published more than five were eight only. Publication density and publication concentration was 3.13 and 20 respectively. Journalwise contribution is depicted in fig.2. Nucleus region had ten journals. Linear region had 11-22 journals. Non-linear region had 23-40 journals.

The important key words with their frequencies are provided in Table 5 and 6. It is clear that she had concentrated her research efforts on the problem of malnutrition among children. She has dealt with overcoming of the disease problems of kwashiorkor, diarrhoea, measles, blindness, anemia, morbidity, growth retardation, ascariasis, cirrhosis, rickets, xerophthalmia etc. Her target groups were mainly children.

Certain journals dealing with health and nutrition have attempted to synthesize medical and nutritional analysis with social science approaches. 'Social science and Medicine' and the 'International journal of Health Services' have sought to bridge the gap between the two. In 1981, the editor of the former journal called for "more scope for the social scientist" cautioning that the current "curative enthusiasm" (e.g., regarding oral dehydration packages) should be "coupled with preventive action and more emphasis... on better water supplies and sanitation", he listed the issues, topics, or programs of concern to developing countries that require an interdisciplinary

partnership in research and policy-making.

"Breast feeding and supplementary feeding; diarrhoeal disease and water and sanitation; disabilities and handicaps; logistics and drug and vaccine delivery; refugee health; monitoring, evaluation and indicators; appropriate technology; and primary health care, which also embraces the above. These issues are of great current concerns and form the basis of projects or programmes into which bilateral and multilateral assistance is being channeled in large amounts. However, there seems to have been little involvement of social scientists as reflected either by their activity in the field, or by their recent publications". (14) Vinodini Reddy has answered well the question of developmental activities related to women vis-a-vis science & Technology by her own example - the contribution by women to the development of science and technology. The need of the hour is to extend the existing programmes and explore new areas where women can contribute more effectively to the developmental process. Towards this end, there is a need not only to provide training in technical skills but also to introduce a component of achievement motivation and building up of self-confidence in women so that they can face the challenges of a developing society fearlessly and with equal if not better competence than men. (15)

The incidence of malnutrition and dietary deficiency diseases is high among the vulnerable sections of the population, namely infants, children and expectant mothers. Nutrition influences and is influenced by socio-economic facts such as family income, education of parents and social relationships. (16)

General modalities, the efforts by medical institutions for the uplift of women in general, should take the following courses. (17)

- i) Uplift of nutritional status of women.
- ii) Uplift by education on common health & family problems.
- iii) Uplift by special training programme for women in medical technology.

iv) Uplift by participation of women in health care delivery system.

Women's development is most crucial for the development of humankind, and women's education is one of the most significant input in women's development. Women's development, assumes greater complexity because of its inter-face with socio-cultural and economic dynamics of the society. Research component in this area is, however, inadequate and thus proper appreciation of the intricacies involved in calling out viable policies become difficult.

It is a welcome feature to note that the women's development is being given increasing importance in policy deliberations by recognising their contribution and role in the family as well as societal development.

### Conclusion

This study has clearly demonstrated that list of publications of a successful scientist can be analysed scientometrically and it can throw light on history of science, scientific development, interactions in the research group, organization of a research system and quality of scientific leadership. Very good science is definitely being done at a number of places in India. Therefore how to spread this scientific culture that exists in a few places, to every nook and corner of the country where science is done so that the very face of science in India can be transformed. It is found that individual (and institutions) which are doing well are the few who can strive to be in touch with intellectual centres outside India by continual visits and exchanges.

### REFERENCES

1. R. Senter, "A causal model of productivity in a research facility", *Scientometrics*, 10(5-6), (1986), 307-328.

2. R.A. Leary, "A framework for assessing and rewarding a scientist's research productivity", *Scientometrics*, 7(1-2), (1985), 29-38.
3. J. Gaillard, "Scientists in the Third World", p.152, Lexington, Ky USA.
4. V.L. Kalyane and S.V.Kalyane, "Scientometric dimensions of innovation communication productivity", *Annals of Library Science and Documentation*, 38(1), (1991), 8-29.
5. S.D. Haitun, "Science studies and natural sciences: Which is primary, distribution or interdependence between variables?", *Scientometrics*, 15(1-2), (1989), 45-58.
6. A. Schubert, W.Glanzel and T.Braun, "World flash on basic research. Scientometric Datafiles. A comprehensive set of indicators on 2649 journals and 96 countries in all major science fields and subfields, 1981-1985". *Scientometrics*, 16(1-6), (1989), 3-498.
7. N.Pravdic and V.Oluic-vukovic, "Dual approach to multiple authorship in the study of collaboration/scientific output relationship", *Scientometrics*, 10(5-6), (1986), 259-280.
8. K. Subramanian, "Bibliometric studies of research collaboration. A review", *Jl.Inf.Sci.*, 6(1), (1983), 33-38.
9. P. Vinkler, "Bibliometric analysis of publication activity of a scientific research institute", *Informetrics*, ed. L.Egghe and R.Rousseeu (Elsevier Science Publishers, B.V. 1990), 309-334.
10. S.Cole, "Age and scientific performance", *American Journal of sociology*, 84, (1979), 958.
11. R.Over, "Does research productivity decline with age?", *Higher education*, 11, (1982), 511.
12. D.K. Simonton, "Quality, quantity and age: The careers of ten distinguished psychologists", *International Journal of Aging and Human Development*, 21, (1985), 241.
13. K.L.Horner, J.P.Rushton, and P.A.Vernon, "Relation between aging and research productivity of academic psychologists?" *Psychology and aging*, 1, (1986), 319.
14. F.J. Bennett, "Editorial social science and medicine", 16(3), (1981), 233-234.
15. J.P. John, "Science, Technology and Women" pp.83-86. In science, Technology and Development, 1. Women" Ed.J.P. John, C.L.Chopra, S.K.Choudhary, DST, New Delhi and RRL, Jammu 1988.
16. B.L. Raina, S.K. Chowdhary and G.S. Gaur, "Adequacy of Diet of Indian women & children at different income levels pp. 55-68. In science, Technology and Development, 1. women, Ed.J.P. John, C.L. Chopra, S.K. Chowdhary, DST New Delhi, RRL Jammu, 1988.
17. R.K. Arya, "Role of medical institution in the uplift of women, pp.49-54. In science, Technology and Development, 1 women. Ed. J.P. John. C.L. Chopra, S.K. Chowdhary, DST, New Delhi, RRL, Jammu, 1988.

Fig. 1

Contributions of Vinodini Reddy

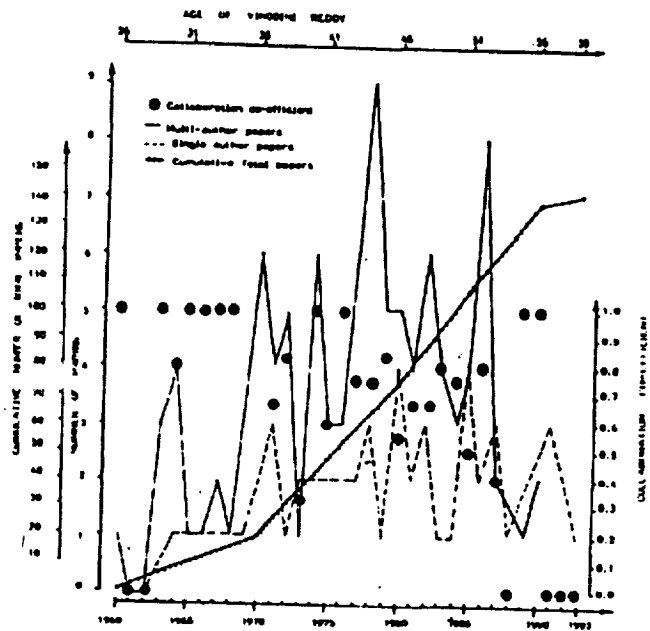


Fig. 2

Journal wise Contributions of Vinodini Reddy

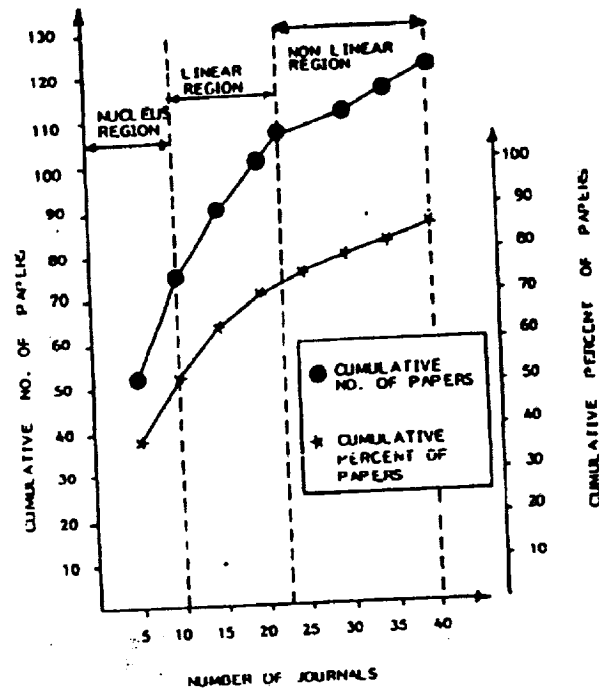


Table 1

Yearwise authorship profile of Vinodini Reddy with Collaboration Coefficient and age

Year	S*	Two		Three			Four				Five				Seven		T O T A L	Colla- bora- tion Coeff- cient	Publication		Age of V. Reddy
	a	a	b	a	b	c	a	b	c	d	a	b	d	e	a	g			as Main Author	as Co. Author	
1960	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1.00	0	1	26
1963	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	3	1.00	1	2	29
1964	1	1	-	-	-	2	-	-	1	-	-	-	-	-	-	-	5	0.80	2	3	30
1965	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.00	1	0	31
1966	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.00	1	0	32
1967	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.00	1	1	33
1968	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	1.00	0	1	34

S\* = Single

1970	-	2	3	-	-	-	-	-	-	-	1	-	-	-	-	-	6	1.00	2	4	36
1971	3	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	7	0.57	4	3	37
1972	1	3	1	-	-	-	1	-	-	-	-	-	-	-	-	-	6	0.83	5	1	38
1973	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.33	2	1	39
1974	-	2	2	-	2	-	-	-	-	-	-	-	-	-	-	-	6	1.00	2	4	40
1975	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	5	0.60	3	2	41
1976	-	1	-	1	-	-	-	-	-	1	-	-	-	-	-	-	3	1.00	3	0	42
1977	2	1	-	1	-	3	1	-	-	-	-	-	-	-	-	-	8	0.75	5	3	43
1978	3	1	4	1	1	1	-	-	1	-	-	-	-	-	-	-	12	0.75	5	7	44
1979	1	-	2	1	-	2	-	-	-	-	-	-	-	-	-	-	6	0.83	2	4	45
1980	4	-	1	-	1	2	-	-	-	1	-	-	-	-	-	-	9	0.55	4	5	46
1981	2	1	1	-	-	2	-	-	-	-	-	-	-	-	-	-	6	0.67	3	3	47
1982	3	2	3	-	-	1	-	-	-	-	-	-	-	-	-	-	9	0.67	5	4	48

1983	1	-	3	-	-	1	-	-	-	-	-	-	-	-	5	0.80	1	4	49			
1984	1	-	1	-	-	-	-	1	-	1	-	-	-	-	4	0.75	1	3	50			
1985	4	-	2	-	-	-	1	-	-	-	1	-	-	-	8	0.50	5	3	51			
1986	2	-	-	1	-	3	-	-	1	1	-	-	-	1	1	10	0.80	5	5	52		
1987	3	-	1	-	1	-	-	-	-	-	-	-	-	-	-	5	0.40	3	2	53		
1988	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.00	1	0	54			
1989	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1.00	1	0	55			
1990	-	1	-	-	-	-	-	-	-	-	-	1	-	-	2	1.00	1	1	56			
1991	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.00	3	0	57			
1993	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.00	1	0	59			
Total	41	21	32	6	6	17	3	2	2	3	2	2	1	1	1	1	1	1	141	0.71	74	67

a First author, b second author, c third author, d fourth author, e fifth author, g seventh author

Table 2

Research group of Vinodini Reddy with authorship pattern in publications

S. Authors no.	I		II			III			IV				V					VII							To	Per-centage	Comm-ulative %
	a	a	b	a	b	c	a	b	c	d	a	b	c	d	e	a	b	c	d	e	f	g					
1. Reddy Vinodini	41	21	32	6	6	17	3	2	2	3	2	2	-	1	1	1	-	-	-	-	-	-	1	141	44.24	44.34	
2. Mohan Ram M.	-	4	2	2	7	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	5.35	49.69	
3. Srikantia S.G.	-	3	6	2	-	1	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	14	4.40	54.09	
4. Bhaskaran P.	-	3	1	2	1	-	2	1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	12	3.77	57.86	
5. Raghurammulu N.	-	2	1	-	2	2	-	-	1	-	-	1	1	-	-	-	-	1	-	-	1	-	-	12	3.77	61.63	
6. Bhaskaran C.	-	3	-	1	1	1	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	9	2.83	64.46	
7. Shivakumar B.	-	3	2	-	-	1	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	8	2.52	66.98	
8. Jagadeesan V.	-	5	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	7	2.20	69.18	



9. Mathur Rita	-	5	-	-	2	-	-	-	-	1	-	-	-	-	1	-	-	-	-	7	2.20	71.38		
10. Vijayaraghavan K.	-	1	1	-	1	-	2	-	-	1	-	-	-	-	-	-	-	-	-	6	1.89	73.27		
11. 68 others	-	5	8	169	5	2	6	7	4	2	2	5	3	4	-	-	1	2	2	1	1	85	26.73	100.00
<b>Total</b>		<b>41</b>	<b>53</b>	<b>53</b>	<b>292</b>	<b>292</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>318</b>

*I Single author paper, II Two author papers, III Three author papers, IV Four author papers, V Five author papers, VII Seven author papers*

*a first author, b second author, c third author, d fourth author, e fifth author, f sixth author, g seventh author*

**Table - 3**

**Author Productivity**

Number papers	Total no. of of Researchers or authors	Total authorships	Cumulative total authorships	Percentage for total authorships	Cumulative percentage for total authorships
141	1	141	141	44.34	44.34
17	1	17	158	5.35	49.69
14	1	14	172	4.40	54.09
12	2	24	196	7.55	61.64
9	1	9	205	2.83	64.47
8	1	8	213	2.51	66.98
7	2	14	227	4.40	71.38
6	1	6	233	1.89	73.27
3	7	21	254	6.60	79.87
2	13	26	280	8.18	88.05
1	38	38	318	11.95	100.00

Table 4

## Journalwise Scattering of papers of Vinodini Reddy

Sl. No.	Title of the Journal/ Channel of communication	Total	Percentage	Cumulative Percentage	Period First paper- Last paper
1.	Ind.J.Med.Res.	18	12.76	12.76	1963 - 1986
2.	Am.J.Clin.Nutr.	12	8.51	21.27	1965 - 1980
3.	I.J.M.R.	8	5.67	26.94	1980 - 1986
4.	Ind.Paediatr.	8	5.67	32.61	1972 - 1993
5.	Brit.J.Nutr.	6	4.25	36.86	1972 - 1982
6.	Acta.Paediatr.Scand.	5	3.54	40.40	1977 - 1991
7.	Clin.Chin.Acta.	5	3.54	43.94	1971 - 1979
8.	Ind.J.Pediat	5	3.54	47.48	1982 - 1988
9.	Brit.Med.J.	4	2.84	50.32	1964 - 1980
10.	Lancet	4	2.84	53.16	1970 - 1990
11.	Proc.Nutr.Soc.India	4	2.84	56.00	1972 - 1985
12.	A.J.C.N.	3	2.13	58.13	1986 - 1989
13.	J.Paed.	3	2.13	60.26	1963 - 1967
14.	Int.J.Vit.Nutr.Res.	3	2.13	62.39	1973 - 1977

15.	Arch.Dis.Child	2	1.42	63.81	1976 - 1980
16.	Human Nutr.Clin.Nutr.	2	1.42	65.23	1985 - 1986
17.	J.Trop.Med.Hyg.	2	1.42	66.65	1975 - 1984
18.	J.Trop.Pediat.	2	1.42	68.07	1986 - 1986
19.	J.Trop.Paed.and Envir. Child Health	2	1.42	69.49	1974 - 1976
20.	Nutr.Res.	2	1.42	70.91	1982 - 1985
21.	Proc.Clin.Biol.Res.	2	1.42	72.33	1981 - 1981
22.	Acta Vitamin Et.Enzyme	1	0.71	73.04	1981 - 1981
23.	Am.J.Dis.Child	1	0.71	73.75	1964 - 1964
24.	Archives of Child Health	1	0.71	74.46	1970 - 1970
25.	Baroda J.utr.	1	0.71	75.17	1982 - 1982
26.	Brit.J.Haemat.	1	0.71	75.88	1967 - 1967
27.	Bull.WHO	1	0.71	76.59	1986 - 1986
28.	Experientia	1	0.71	77.30	1983 - 1983
29.	Ind.J.Child Health	1	0.71	78.01	1960 - 1960
30.	Ind.J.Communi.Med.	1	0.71	78.72	1984 - 1984
31.	Ind.J.Gastroenterol	1	0.71	79.43	1985 - 1985
32.	Ind.J.Nutr.Diet	1	0.71	80.14	1979 - 1979
33.	J.A.I.I.M.S.	1	0.71	80.85	1978 - 1978

34.	J.Assn.Phys.India	1	0.71	81.56	1985	-	1985
35.	J.Food & Nutr. Australia	1	0.71	82.27	1983	-	1983
36.	J.Nutr.Sci.&Vitaminol.	1	0.71	82.98	1987	-	1987
37.	Neth.Milk Diary J.	1	0.71	83.69	1973	-	1973
38.	Nutr.Metab,	1	0.71	84.40	1978	-	1978
39.	Nutr.Rep.Internat.	1	0.71	85.11	1982	-	1982
40.	Paed.	1	0.71	85.82	1968	-	1968
41.	PAG Compendium	1	0.71	86.53	1971	-	1971
42.	Rev.of Infer.Dis.	1	0.71	87.24	1982	-	1982
43.	World Rev.Nutr.Diet	1	0.71	87.95	1978	-	1978
44.	Papers in international conference	10	7.09	95.04	1975	-	1991
45.	Chapters in international Books	7	4.96	100.00	1980	-	1991
<b>Total</b>		<b>141</b>					

**Table 5**  
**Keyword frequencies in the titles of papers by Vinodini Reddy**

Key word	Frequency	Key word	Frequency	Key word	Frequency
Children	44	Immunology	8	Bacteriology	4
Malnutrition	35	Plasma	7	Cell-mediated immunity	4
Vitamin A	23	Diarrhoea	6	Human milk	4
Nutrition	19	Measles	6	Morbidity	4
Vitamin A deficiency	18	Blindness	5	Mother	4
Protein energy (calories)	13	Leucocytes	5	B-Carotene	3
Kwashiorkor	11	Preschool children	5	Ferritin	3
Serum	10	Vitamin D	5	Green leafy vegetables	3
		Anemia	4		

Growth retardation (failure)	3	Ascariasis	2	Nitrogen balance	2
Hypervitaminosis A	3	Cirrhosis	2	Oral rehydration	2
Hypovitaminosis A	3	Creatinine metabolism	2	Rickets	2
Infection	3	Gastroenteritis	2	Pregnancy	2
Intestinal	3	Humoral	2	Urinary excretion	2
Massive dose	3	Iron deficiency	2	Urinary nitrogen	2
Primary health care (clinics, hospital) services	3	Lactose deficiency	2	Vitamin E	2
Retinol - binding protein	3	Light-for-date	2	Well water	2
Acid mucopolysaccharides	2	Lysosomal enzymes	2	Xerophthalmia	2
		Marasmus	2	Zinc	2
		Mortality	2		
		Mucopolysaccharides	2		

**Table 6**  
**Keywords used only once in the titles of papers by Vinodini Reddy**

Absorption of fat	Cutaneous inflammation	Infants	Placental function
Adult	Cystic fibrosis	Inhibition factors	Post vaccinal tuberculin
aflatoxin	Cytology	Lactation	Ribonuclease activity
Albumin	Deworming	Lactose intolerance	Rose bengal staining
Alkaline phosphates	Dietary fat	Liver	Salt solution
Alkaline ribonuclease	Dietary phytate	Lysin supplementation	School
Alpha antitripsin	Environmental stress	Lysozyme	Secretory IgA
Ascorbic acid	Fat soluble vitamin deficiencies	Macropage	Small for data
Biochemical	Foods	Magioblastic	S sulphate
Buccal smear	Grading of PEM	Magnesium	Supplementary feeding
C <sub>3</sub>	Haematology	Maple syrup	Types of vessels
Calcium	Harward standard	Mass distribution	Tryosine metabolism
Clinical	Helminthis	Milk intolerance	Urinary disease
Colour vision	Hookworm	Nitrogen retention	Vitamin B
Conjunctival	Hartnup disease	Opaque-2 maize	Wearing
Copper metabolism	Immuno competence	Oral rehydration	Wheat
Corneal lesions		Pathogenesis	
Counjunctival xerosis		Physiological effects	