An Intervention to Improve Dietary Iron Intake Among Women and Adolescents Through Community Kitchens in Lima, Peru.

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Final Report

ABSTRACT

As a result of formative research that was conducted to explore knowledge and perceptions of anaemia, health and diet by adult women and adolescent girls of reproductive age participating in Community kitchens (CK) in a peri-urban population in Lima, Peru, a dietary education campaign was developed, primarily to improve the menues served in the CKs. The intervention strategy focussed on increasing awareness of the vulnerability of women to anaemia, and the motivation for dietary change using the body image perceptions and aspirations of the women and girls. The dietary strategies included increasing the availability and use of low-cost haem iron food sources, increase consumption of vitamin C-rich drinks and salads with meals containing non-haem iron food sources (beans), and stimulate menu planning in the CKs. The intervention was implemented and monitored during 8 months in 9 CKs. A control group of 8 CK received education on unrelated topics during the same period.

The evaluation pre- and post-intervention was conducted in 96 (pre) and 77 (post) AW and 71 pre, 50 (post) AdG in the intervention ComCommunity, and in 77 (pre) and 68 (post) AW and 65 (pre) and 42 (post) AdG in the control Community. There were fewer participants in the post evaluation due to loss to follow-up or some not accepting the second blood sample. SES and dietary intake (2 days' 24-hour recall) were similar between the 2 groups prior to the intervention. Total and haem dietary iron intake was low in all groups (30% - 39% of requirements). The total iron intake increased from 6.6mg/day to 8.8mg in AW and from 7.7mg. to 9.4mg in AdG in the intervention group, with no change in the control group. Neither haem iron or available iron intake changed in the AW but significant increases from 0.6 to 1.0mg/day of haem iron and from 0.55 to 0.71mg/day available iron was demonstrated in the AdG intervention group, with no change in the controls. Similarly there was a increase in vitamin C intake.

Prevalence of anaemia (haemoglobin), 35% AW, 15% AdG, and iron depletion (serum ferritin), 36% AW, 21% AdG, did not change in the intervention munities but increased significantly in the control Community: anaemia prevalence from 27% to 41% in AW and from 14% to 38% in AdG, indicating a considerable deterioration in their iron status, reflected in a similar change in serum ferritin levels in AdG although not in AW. It appears that the dietary improvements may well have protected iron status in the intervention Community. The increase in knowledge of diet and the prevention of anaemia was highly significant in the intervention groups, particularly so with the AdG.

The dietary changes are most notable in the CK menus where there was higher frequency of use of the promoted haem iron sources (mean 1.15 times/week intervention CK, 0.04 times/week control) and more use of the bination of beans with a vitamin C-rich source. However use of the CK was found to be infrequent, being on average once a week, which may account for the reduced effect of the intervention on dietary intake and anaemia levels. Interestingly there was a greater effect observed with the AdG than with the AW, indicating a potential for dietary change through education.

INTRODUCTION

Iron deficiency anaemia (IDA) is the most prevalent nutritional problem worldwide. It has numerous and severe consequences on the health, development and well-being of the population, the most vulnerable groups being women of fertile age and children because of the high requirements for growth and reproduction.

Pregnancy is a high risk period and supplementation is required to maintain iron balance during this state. Because iron can be stored in the body, preventing iron deficiency can be approached by improving iron balance during or prior to the high risk period. Thus, iron status in pregnancy can also be improved by enhancing iron stores of women prior to their first pregnancy or between pregnancies, and which also has the extremely important effect of improving the health and well-being of the female population.

Improving dietary intake is an important strategy to prevent IDA by increasing total dietary iron intake, increasing haem iron food sources and/or the iron bioavailability of the diet, through the increase in the intake of enhances and reduction of food inhibitors. Dietary modification is not easy to achieve, and usually occurs over long periods of time. Examples of these include the increased intake of fibre and reduced fat in Western countries. There has been little reported on successful dietary change to improve micronutrient intakes in programmes, although a number of initiatives have menced, particularly with respect to vitamin A. A recent review conducted by Laura Caulfield of several projects and programmes conducted at the Community level to improve infant feeding practices show beneficial changes in diet, including increased intakes of specific foods such as liver, fish, greens, in different parts of the world. Significant effects of these dietary changes on biological outes such as growth of the children have generally not been demonstrated.

Dietary modification implies understanding the patterns of food intake and perceptions of the population regarding their diet, nutrition and health. The foods remended need to be available, economically attractive and culturally acceptable. Haem iron is frequently a limiting factor in many diets due to economic and availability constraints. Nevertheless in Peru, as in other countries, there are less expensive sources of haem iron available, such as chicken's offal, blood and fish, that can be promoted. Also there is a diversity of foods available that have the potential advantage of increasing total iron availability through changes in consumption patterns.

The present study developed, implemented and evaluated an education intervention programme to improve dietary iron intake, and thus prevent IDA and increase well-being and work capacity, for non-pregnant or lactating adult women of reproductive age and adolescent girls in a peri-urban population of Lima. The intervention was implemented through local Community organizations, Community kitchens (CK). The Community kitchens are organized and run by the women and who decide on the food and menus prepared, thus the knowledge of a better quality diet permits a further opportunity for empowerment of the women and girls for control over their own dietary intake, nutrition and health.

The study menced with a period of ethnographic formative research to explore the knowledge and perceptions of the women and adolescent girls towards their nutrition,

foods, health, blood, anaemia, motivations and self esteem, as well as the functioning of the CKs, decision making in relation to the selection of the menus and use of the CK. This has been described elsewhere. With the analysis of this information the conceptual model for the munication strategy was developed. The motivation for behaviour change focused on increasing the awareness on the part of the women and the adolescent girls towards their vulnerability towards anaemia, and to relate this to their health and well-being, diet and their motivations and self-esteem. The principal strategies were to increase knowledge about a balanced diet with emphasis on foods to prevent anaemia and to increase the consumption and bioavailability of foods rich in iron through the Community kitchen menus and the home, using locally available and acceptable foods.

Study population

The study population is adult women and adolescent girls who live in the poor urban areas that surround Lima. These populations began as invasions of the desert lands mencing 30-40 years ago, and for many years prised recent immigrants from the poor areas of the provinces, seeking better work and education opportunities. Now many of these housing areas are established, many have services but there are still large areas without access to electricity, water or sewage. Although there are varied degrees of personal and family development, they continue being the areas where the urban poor live.

The Community kitchens menced in the early 1980s as a response to difficult economic conditions and as a way of making greater use of available resources, initially through the munal cooking of a group of families. During the 80s, and even more so the early 90s, the number of CKs in Lima grew tremendously, reaching around 7,000 in the early 90s. They receive donated foods and some subsidy from different charities and a government organization, but in recent years this has diminished, causing several of the CKs to close, reduce or change their function to a more mercial approach.

As a result of the ethnographic research we found that the CKs cater for the poorer groups of the population, and do not in fact have a very large coverage. The members elect a president and treasurer, and there is a core group of active members who in coordination with the president, plan and prepare the daily menus. Contrary to our expectations we found that apart from the most active members the CK's are generally not used daily by most of the beneficiaries. Nevertheless working through the CK at the time of the study was a way of reaching some of the most vulnerable women in the Community and strengthen their Community organization.

Study design

The design of the study is a parison between an intervention and control Community. Within each Community the Community kitchens selected were randomized. Due to possible "contamination" of messages between CKs within the same Community, the intervention and control munities were geographically separate: adjacent populations with similar characteristics.

Selection of the Community Kitchens

The CKs within each of the intervention and control munities were selected randomly from

a total of 65 CKs in each area. According to the estimated sample size 8 CKs in each group were required. In fact 9 CKs were included in the intervention group and 8 in the control group to reach the initial estimated sample. In each of the munities there were 2 basic types of populations, a poorer sector higher on the hillsides and less poor areas lower down. For each of these sectors 4 - 5 CKs were selected randomly from the list of total CKs and were subsequently visited and invited to participate in the study. Criteria for participation in the study included i) that the edor had existed for at least 4 years, thus assuring a certain degree of stability, ii) the number of members be at least 15, iii) the total number of rations prepared daily be between 100 and 180, iv) periodic meetings are held and that the organization does not depend on only one person/leader, v) a register of members, foods purchased and donated etc. is kept, vi) representation of CKs with different types of institutional assistance and vii) that the members are interested and willing in participating.

Selection of the study participants.

Adult women and adolescents were randomly selected from the lists of members and beneficiaries from each of the selected CKs. According to the sample size we required 10 - 11 adult women and 6 adolescents from each edor. We actually enrolled between 7 - 18 adult women and 2 - 12 adolescents from each edor; the criteria for participation was a) non-pregnant or lactating adult women aged 18 - 39.9 years, and b) adolescent girls aged 12 - 17.9 years.

Intervention design and implementation

The intervention consisted of 3 ponents:

a) increased motivation and knowledge of iron-rich and related foods by the leaders of the CKs and application in the menus,

b) increased motivation and knowledge on the part of the adult women and adolescent girls, members and beneficiaries of the CK menus to modify their dietary intake, and

c) increase availability and accessibility to cheaper food sources of haem iron.

With the analysis of the formative research and a series of focus groups and participatory recipe trials to test the selected remendations, the principal messages were the following: a) increase haem iron food sources in the main dish, b) increase the consumption of vitamin C-rich drinks with meals containing non-haem iron food sources, c) increase vitamin C-rich salads with meals containing non-haem food sources, and d) menu planning with the CK.

For the educational ponent materials were produced and used in the training sessions, for use in the CKs and for distribution to the individual participants. They included a motivational poster to promote a "Balanced Diet", a poster to promote cheaper haem iron food sources, a mobile to promote the consumption of lemonade with beans, the most monly used non-haem iron source, recipe booklets, guides for menu planning, cards of foods for different exercises and games, and a folder for the adolescents, stickers, T-shirts, pencil case, biros and rulers, all with key messages of the campaign. All

the materials were tested during their development in focus groups with the target population.

Several training and education sessions were held during the 8 months of the intervention campaign. Firstly with the CK leaders and those responsible for the menu planning, then on different occasions with the adult women and groups of adolescent girls for each of the CKs. These sessions were mostly held with the women and girls from 2 adjacent CKs. All members and beneficiaries were included in the intervention regardless of whether they were selected for the evaluation.

One of the limitations found was the difficulty in obtaining the haem iron food sources. In order to facilitate this, an arrangement was made with a large mercial chicken producer, to facilitate direct access to chicken's liver and blood at cost price, to be collected by the Community kitchen representatives twice a week. For four months the menues were planned in accordance with the weekly ordering of these products, and this functioned extremely well, permitting greater use of cheap haem iron products between October 1996 and January 1997. Unfortunately the arrangement was discontinued as all the chicken producers suffered an economic crisis as a result of government regulations in February, 1997, and so this source discontinued. Initiatives were explored with other chicken farms without success. As the use of chicken's liver had bee accepted by the CKs this was continued to be used although less regularly and in smaller quantities, purchased from the local market.

Monitoring and evaluation strategy

Monitoring:

Weekly visits were made initially to the CKs to aid in the menu planning; the frequency of visits was subsequently reduced. Monitoring of the process of the intervention was conducted through interviews with leaders of the CKs, adult women and adolescent girls participating.

Several advances and some deficiencies were identified. In general the vulnerability of women to anaemia was recognized and appropriate food binations for a balanced diet was remembered. The use of lemonade or salad with beans was understood, as was the remendation of consuming liver as frequently as possible. Both liver and beans were being incorporated into the menus. Some of the posters were not being noticed, the recipes were being adopted in the CKs but very little in the homes, and the menu planning by the CK's was not easy.

As a result of this monitoring the following actions were taken:

a) more emphasis in the training sessions with the CKs and adult women on the use of liver and other sources of haem iron, stressing the economic and nutritional advantages of these products, particularly as the cheaper source of liver and blood from the chicken producer had discontinued.

b) more emphasis in the training sessions with the adolescent girls on the relationship of food and health, sources of haem iron and binations of food.

c) greater emphasis on the distribution of individual and utilitarian education materials.

Evaluation strategy:

The impact of the intervention was measured through the parison of a base-line and final evaluation amongst the participant women and girls in intervention and control munities. The following instruments were applied to all participants:

1. A survey instrument for socio-economic and demographic characteristics.
2. A 2-day (successive) dietary recall and food frequency questionnaire.
3. Height and weight.
4. Knowledge.
5. Venous blood sample for iron nutritional status.

Additionally in the final evaluation:

6. Exposure to media and messages in both the intervention and control groups.

RESULTS

Table 1 shows the final sample included in the base-line and final evaluations. The adult women, were those from the random selection who accepted participate at base-line in both the evaluation of dietary intake and the taking of the blood sample for the evaluation of iron nutritional status. The loss to follow up for the final evaluation, almost 1 year after the initial evaluation, greater amongst adult women than adolescent girls, was due to several reasons: the most mon reason was being pregnant (18 adults and 3 adolescent girls), others included not accepting the second blood sample (11 adults, 2 adolescents), moving out of the area or mencing work and not being found at home (13 adults, 2 girls). Only one woman was excluded for haemoglobin <8g/dl.

Differences between those subjects who were present in the final evaluation and those who dropped out were examined for socio-economic and demographic characteristics, prevalence of anaemia, haemoglobin and ferritin levels, intakes of energy and nutrients including haem iron. The only significant differences found were: a) in the intervention Community, adults: number of people living in the home; adolescent girls: number of years of study, b) in the control Community, adults: number of years living in Lima. There were no significant differences between these groups for all dietary intake and food frequency data, nor for biological indicators, thus the results presented are for the full sample included in the base-line evaluation.

Population characteristics

Specific population characteristics are presented in tables 2 and 3 which indicate the similarities between the intervention and control groups for the variables age, number of children, time living in Lima, number of members of the household, occupation, expenditure on food, frequency of use of the CK and a socio-economic score developed on house structure and facilities. The only significant differences between the intervention and control groups for adult women found were the following: in the control Community there was a higher number of single women, 16 years living in the sector as pared to 13,

and 2 years more of education. The BMI and a reported previous history of anaemia were both higher in the intervention group. There were no significant differences in any of the variables between intervention and control groups for the adolescent girls.

Community kitchen menues.

The dietary intervention was conducted through the Community kitchens. It began with a training for the Community kitchen leaders and those responsible for the menu planning, in September, 1997. From this date, and using the educational materials prepared, the Community kitchens were visited weekly to help in their planning.

Interestingly, during the accessibility of liver and blood from the mercial chicken producer, the purchase of liver steadily increased during the 4 months, whereas that for blood decreased, indicating the relative acceptability of these products and the potential for chicken's liver if readily accessible (table 4).

In the fourth month of the intervention the menues between the 9 intervention and 8 control Community kitchens were pared during 4 weeks, using information taken from their menu records (table 5). The use of haem sources, particularly the promoted chicken's liver was higher in the intervention CKs: mean 1.1 times per week as pared to not used at all in the control CKs. Although the intervention CKs initially proposed using these products twice a week, this is fact was not found to be very acceptable on the part of the clients. The use of the bination of non-haem iron sources (primarily beans) with a vitamin C source (salad with lemon juice) was considerably more frequent in the intervention (1.5 times/week) than in the control CKs (0.1/week), and, to a lesser extent, the bination of beans with a haem iron source. Beans and lemonade was an integral part of the intervention, but drinks are not prepared in the CK, and lemonade was promoted to be prepared in the home.

The menues in the intervention CKs were monitored during 27 weeks of the intervention (November 96 - May, 97). During this period any haem iron sources (frequently including only small portions of chicken meat) were used a mean of 3.2 times a week, promoted chicken's liver/blood,spleen and fish, 1.6 times a week, the bination of beans and salad, 1.7 times and beans with an animal product, 0.24 times, indicating a sustained use of the adopted intervention remendations (table 6).

Knowledge and media

The increase of knowledge with respect to the messages of the campaign and exposure to the media is extremely high. The knowledge towards anaemia and foods related to it's prevention were evaluated through simple questions in both the intervention and control groups before and after the intervention. The increase in knowledge in the intervention group for both women and girls was considerable and significantly different from the control group. This increased knowledge was confirmed in the final evaluation where knowledge of the specific messages of the intervention were significantly greater in the intervention Community pared to control for: awareness of the vulnerability of women for anaemia, haem iron food sources are good to prevent anaemia, vitamin C food sources are best eaten with beans and remended frequency of eating liver and fish twice a week (table 7). A message which appears to have had considerable impact, and perhaps a

"red-flag" one associated with the campaign, is to consume fruits and salads shortly after preparation so as avoid loss of vitamin C activity.

The reasons for the remendations have also been well understood, particularly consuming beans with a vitamin C source to take advantage of the iron (table x). In the case of the adolescents particularly, the relationship of eating liver and being better at studies, and eating fruit after the main meal are expressed.

Exposure to the campaign has been almost universal in the intervention Community, either through the meetings and contacts with the CKs, the materials and media or home visits. Although several meetings with the control CKs were conducted to discuss breastfeeding and treatment of diarrhoea it is notable that the attendance was considerably less (table 9). Interestingly the media and materials most appreciated and remembered by all were the T-shirts, pencil case and folders, and the messages on each of these were repeated correctly, whereas the posters and mobile were less observed, although those who had seen them remember the message. The materials that are able to be used by the target group were by far the most successful.

Dietary intake.

The energy and nutrient intake, mean of the 2-day dietary recalls, for the adults and adolescent girls are presented in tables 10 and 11 respectively. In the case of the adult women it can be seen that the intakes of energy are low in the pre-test, in fact most nutrients are low in relation to remended daily intakes (RDI) for both intervention and control groups, particularly for iron, being only 30% of the RDI at the base-line evaluation, considering medium bioavailability (WHO/FAO 1989). Available iron has been calculated using the algorithm proposed by Murphy et al. for individuals who are not anaemic but iron deficient, using the total day's intake (table 12). Intakes of haem and available iron are very low: the remended intake is 1.25 mg/day for menstruating women. There were no differences in intakes between the intervention and control groups at base-line.

Significant increases in intake of the adult women were found in the intervention Community in the post-evaluation for energy, protein, total iron and ascorbic acid, but not for haem or available iron, indicating that the increase has been in non-haem iron. No significant increases in consumption were found for any nutrients in the control group. Significantly better intakes were found between the intervention and control groups in the final evaluation for energy and total iron. Changes in total iron intake and haem and available iron are shown in figures 1 and 2.

Bivariate analysis is showing that the intake of haem iron is correlated with socio-economic status; the intake of haem iron of higher SES status women in the intervention group is twice that of the lower SES women. This is not surprising as haem iron sources are more dependent on purchasing capacity. Further relationships are being explored.

In the case of the adolescent girls significantly improved intakes in energy, protein, proportion of protein from animal sources and vitamin C were found in the intervention group after the campaign, and most interestingly, for energy, protein, haem iron, available iron and ascorbic acid in the intervention group pared to control at the final evaluation, Significant increases from 0.6 to 1.0mg/day of haem iron and from 0.55 to 0.71mg/day

available iron was demonstrated in the AdG intervention group, with no change in the controls. There was no change for any nutrient in the control group. Changes in total iron intake and haem and available iron are shown in graphs 3 and 4.

Although there was some change in the available iron intake by the adolescent girls the intake in the post-test (mean 0.71mg/day) is still low, well below remended 1.62mg/day for adolescent girls.

Food frequency.

The frequency of consumption of selected foods for adult women and adolescent girls is shown in tables 13 and 14 respectively. There were no significant increases between intervention and control populations at base-line. In general increases in reported food frequency have been small. Nevertheless significant increases in the proportion of the population with greater frequency were reported in the intervention group for lentils (a source of non-haem iron and a food mentioned by the population as having a high iron content), blood pudding and oranges. A significant increase in the frequency of use of oranges was also reported by the control population, probably reflecting the seasonal availability. Similar results are shown for the adolescent girls with the exception of blood pudding.

Iron nutritional status.

The prevalence of anaemia in both the intervention and control populations is high, being 36% and 27% respectively at base-line (the difference non-significant). This prevalence did not change significantly in the intervention Community, either for adult women or adolescent girls (graphs 1 and 2), although there was a tendency for improvement among the girls. There was a slight tendency for the prevalence of iron depletion (serum ferritin) to diminish in both adult women and adolescent girls although this was not significant in either case.

However, the prevalence of anaemia increased considerably in the control Community for both adult women and adolescent girls (graphs....), indicating that the situation appeared to deteriorate during the year of the study. This may mean that the campaign at least had a protective effect to prevent against anaemia. In the case of the adolescent girls the prevalence of iron depletion showed a tendency to increase (non-significantly), but surprisingly decreased in the adult women. We have explored the role of infection in the serum ferritins in the post-test by examining the C-PR, but this does not appear to explain the higher levels of serum ferritin.

Final ethnographic evaluation.

For the leaders of the CKs the experience has been helpful to their menu planning and opened the possibility of being able to change. They feel they have benefited from the concepts of more nutritious food binations, particularly those that enhance the availability of iron. the participative process and education sessions were new and attractive. The experience with the chicken producers was successful, but it's discontinuation made it more difficult for the CKs to implement their changes, and they found that it was difficult to maintain the same level of use of liver.

A principal achievement has been in the change of the image towarsd both liver (especially) and beans. Liver has easily been incorporated in different ways in the menus. The concept of "beans and lemonade or salad" is well known but the reasons for these are vague and not understood. Blood is recognized as being nutritious but it's acceptability did not improve.

The adult women have expressed interest in having been able to "learn a little more", how to bine foods and make meals more nutritious. They have liked the advice given and the new recipes learnt, particularly those with liver. The idea of consuming beans with lemon they found novel, although the reason why was not clear. The women mention that their perception of liver has changed and that this now replaces chicken meat. Perceptions towards the CK menus are varied.

For the adolescent girls the experience was particularly interesting and the games employed in the training were mentioned. They expressed the importance of learning new and interesting information, and their capacity of telling their friends of this new knowledge has given them a new status. The girls have understood that the bination of beans and lemon is to take better advantage of the iron. This is interesting as we were surprised at their lack of physiological knowledge in the ethnography. Their images of anaemia (and in relation to menstruation) and beans have changed, as well as a difference in attitude to liver. Nevertheless it is clear that their interest in menus from the CK is limited.

DISCUSSION

This intervention to improve dietary iron intake of adult women and adolescent girls of reproductive age through community kitchens has been extremely successful in some aspects and less so in others. A dramatic increase in knowledge for both the women and the girls has been demonstrated: the communications strategy was successful in this regard, the education materials selected captured the interest of the target populations and were appropriate for increasing knowledge.

The menus of the community kitchens improved during the 8 months of the intervention campaign, both with increased use of haem iron and non-haem iron with salad. This was achieved and sustained to some degree, in spite of difficulties of the CKs in their menu planning. Total iron and haem iron increased in the CK menues although not to the level that is probably required in order to have an adequate impact.

Accessibility to cheaper haem sources is required to facilitate greater and more frequent use of these products. The initiative with the commercial chicken producers proved to be an excellent strategy that permitted greater use of liver; it was unfortunate that this could not be sustained and the CK menus were affected. Strategies to improve accessibility to these products need to be found.

The increase in dietary intake of total iron, haem iron and absorbable iron as estimated through the 2-day dietary recalls was minimal with the adult women. Non-haem iron was the component that increased. There may be several reasons for this. The 2-day 24-hour recall may well not have adequately picked up the days when haem iron sources

were consumed, although the frequency of intake was not contradicted by the results of the food frequency questionnaire evaluation. Haem iron sources are more expensive foods. Although the CK menus improved the women only used them on average for 1 day a the week and changes in the home do not seem to have been made. If they were, it is the adolescent girls who were able to take advantage of them, perhaps the mothers continue to give preference to her children and other members of the family. We were surprised by this finding as we had originally though t that use of the CKs was more constant. The women and girls were selected randomly from the CK list of members and beneficiaries, and this seems to be a current pattern of use of the CKs at the time of the study. CKs are used when the family needs to, but if there is a little more money available the preference is always to have home-cooked food. We think that dietary strategies through CKs are limited due to the low coverage in the community and their infrequent use.

We used the algorithm of Murphy et al. for the calculation of available iron during the day. Both animal products and vitamin C increased in the individual diets, but not to the level of 35mg vitamin C/1000 kcals or >9g haem food protein required to increase the availability factor to significantly affect intake.

It appears that these levels of iron intake were able to protect the intervention group from higher prevalence of anaemia, although with the levels of iron intake no effect on biological outcomes would be expected. Nevertheless in the control community the situation was worse. On the other hand eight months of intervention is a relatively short time to expect changes. It is hard to explain the changes in prevalence of iron depletion in the control community.

Interestingly, there was a overall greater effect of the intervention, in terms of both increased knowledge and dietary intake with the adolescent girls, who appear to have become more concerned with their diet, and the knowledge has given them a greater self-esteem as well as a beneficial effect on their diet. This knowledge was found to be almost non-existent in the formative research, and we were surprised by this impact. The girls were very motivated by doing better in their studies, and it seems that they were more motivated to change than the adult women who, as well as prioritising other members of the family, were probably less motivated to change. This impact with the adolescent girls is very interesting and indicates a potential for education and change.

Acknowledgements and Support

This project was financed by The MotherCare Project, JSI., AID. We are also grateful to the British Embassy Ambassadors Fund for providing funds for the education materials, and to Rubén Villasante who assisted in their development and

Table 1

EVALUATION DESIGN

	Total Number of Participants			
	Intervention		Control	
Community Kitchens	9		8	
	Pre	***Post***	***Pre***	***Post***
Adult women				
♦ Dietary intake: 24-hr. recall, 2 days	96	77	101	68
♦ Food frequency				
♦ Iron nutritional status	96	67	101	64
♦ Anthropometry				
♦ Base-line knowledge				
Adolescent Girls				
♦ Dietary intake	71	65	50	42
♦ Food frequency				
♦ Iron nutritional status	71	65	50	40
♦ Anthropometry				
♦ Base-line knowledge				

Table 2

SELECTED SOCIO-ECONOMIC CHARACTERISTICS OF ADULT WOMEN IN INTERVENTION AND CONTROL COMMUNITIES

	Percentage of Population	
	Intervention	**Control**
Age (years)	31 ±6	29 ±6
Marital Status:		
Single	15.6%	29.7% *
Married	77.1%	64.4%
Number of Children	3 ±2	3 ±1
Time living in sector	13 ±7	16 * ±9
Education (years)	7 ±3	9 * ±3
Occupation: Housewife	71%	66%
Number of people in home	6 ±2	6 ±2
SES score	12.3 ±2.5	12.0 ±3.3
Amount of money on feed/day (US$)	5.65 ±2.8	5.16 ±2.33
Number of days use CK/week	1	1
BMI	26.5 ±4.4	24.9 * ±3.6
History of anaemia	56.3%	33.7%*

* p=<0.01

Table 3

SELECTED SOCIO-ECONOMIC CHARACTERISTICS OF ADOLESCENT GIRLS IN INTERVENTION AND CONTROL COMMUNITIES

	Percentage of Population	
	Intervention	**Control**
Age (years)	**14 ±2**	**14 ±2**
Education (years)	**7 ±2**	**7 ±2**
Occupation of mother: Housewife	**59.2%**	**68.0%**
Number of people in home	**7 ±3**	**7 ±2**
SES score	**13.8 ±2.7**	**13.5 ±3.2**
Amount of money on food/day (US$)	**6 ±2**	**5 ±2**
Number of days use CK/week	**1**	**1**
BMI	**20.5 ±3.2**	**21.5 ±3.8**
History of anaemia	**11.3%**	**4.0%**

TABLE 4

DISTRIBUTION AND CONSUMPTION OF CHICKEN LIVER AND BLOOD BY 8 COMMUNITY KITCHENS(CKs)

Month	Amount Kg. Average / week	
	Chicken's Liver	Chicken's Blood
October 96	37.2	34.2
November 96	57.1	8.0
December 96	53.0	2.1
January 97	93.7	0

Table 5

COMMUNITY KITCHEN MENUES, JANUARY 1997 (4 weeks)

	Mean Frequency Per Week	
	INTERVENTION (9 CK)	**CONTROL (8 CK)**
Any haem iron source	2.8	2.1
Use of promoted haem sources:		
chicken's liver	1.1	0
chicken's blood	0.1	0
Combination: beans + salad	1.5	0.1
Combination: beans + haem source	0.33	0.06

Table 6

COMMUNITY KITCHEN MENUES
INTERVENTION 9 COMMUNITY KITCHENS
(27 weeks)

	Mean Frequency per week
Any haem iron source	**3.2**
Liver/ blood/ spleen/ fish	**1.6**
Combination: beans + salad	**1.7**
Combination: beans + haem source	**0.24**

Table 7

EVALUATION OF KNOWLEDGE AFTER THE CAMPAIGN IN INTERVENTION AND CONTROL COMMUNITIES

	PERCENTAGE OF POPULATION					
	ADULT WOMEN			ADOLESCENTS GIRLS		
	Interv.	Control	p<0.01	Interv	Control	p<0.01
1.When a woman does not eat well?						
Anaemia	97	71	*	97	45	*
2.Which foods prevent anaemia?						
Liver, fish, blood	68	16	*	64	7	*
Beans + Vitamin C source	28	15	ns	36	17	*
3. What is best to eat with beans?						
Salad, lemon, fruit	95	24	*	100	19	*
4.How best take advantage of vitamins in fruit/salads?						
Freshly prepared	92	0	*	94	0	*
5.What is the best time to drink lemonade?						
After eating beans	84	0	*	72	0	*
With lunch	15	56	-	27	36	-
6.How many times/week eat liver and fish?						
Twice	83	29	*	72	14	*

Table 8

EVALUATION OF KNOWLEDGE AND MEDIA
AFTER THE CAMPAIGN IN INTERVENTION AND CONTROL COMMUNITIES

MESSAGE HEARD	PERCENTAGE OF POPULATION					
	ADULT WOMEN			ADOLESCENT GIRLS		
	Interv.	**Control**	**P<0.01**	**Interv.**	**Control**	**P<0.01**
1. How to be:_ *"Healthy and Pretty"*	90	27	*	94	6	*
2. *Beans + salad or lemonade"*	100	9	*	100	1	*
Reason*: Take advantage of iron*	46	0	*	44	0	*
Good for health	32	2	*	25	0	*
3. *"Ëating liver better at studies"*	95	3	*	100	4	*
Reason: *Helps the memory*	45	0	*	64	0	*
Prevents anaemia/nutrition	49	1	*	31	2	*
4.*"Enjoy fruit after main meal"*	64	20	*	91	16	*
Reason: *Take advantage of iron*	12	0		14	0	
Gives vitamins	57	0	*	56	0	*

Table 9

EVALUATION OF MEDIA AFTER THE INTERVENTION IN INTERVENTION AND CONTROL COMMUNITIES

	Percentage of Population					
	Adult Women			Adolescent Girls		
	Interv.	Control	P<0.01	Interv.	Control	P<0.01
Attended meetings	76	13	*	84	5	*
Seen posters	54	2	*	47	0	*
Message of posters						
Correct	42	-	*	28	-	*
Seen mobile	49	0	*	42	0	*
Received pencil case	100	0	*	100	0	*
Received T-shirt	100	0	*	100	0	*
Message of T-shirt						
Correct	99	0	*	98	0	*
Preferred material						
1. T-Shirt	68	-		48	-	
2. Pencil case	21	-		16	-	
3. Folders	-	-		20	-	

Table 10

MEAN (SD) INTAKES OF ENERGY AND NUTRIENTS BY ADULT WOMEN BEFORE AND AFTER THE COMMUNITY KITCHEN INTERVENTION IN INTERVENTION AND CONTROL COMMUNITIES

	INTERVENTION		CONTROL	
	Pre	Post	Pre	Post
n	96	77	101	68
Energy ** Kcal/day	1127 ±300	1409 * ±370	1240 ±347	1310 ±350
Protein g/day	32.7 ±10.3	41.6 * ±13.2	34.9 ±10.8	37.9 ±10.9
% Animal protein	28 ±13	29 ±13	30 ±13	32 ±13
Total Iron *** mg/day	6.63 ±2.3	8.83 * ±3.6	7.17 ±3.0	7.84 ±3.8
Haem Iron mg/day	0.62 ±0.56	0.58 ±0.64	0.66 ±0.62	0.86 ±1.16
Available Iron mg/day	0.51 ±0.26	0.54 ±0.35	0.50 ±0.26	0.59 ±0.47
Ascorbic acid mg/day	44 ±33	56 * ±40	43 ±35	54 ±36

* Pre vs Post: p=<0.01 **Post:Interv vs Cont, p=<0.015 ***Post:Interv vs Cont p=<0.05

Table 11

MEAN (SD) AND INTAKES OF ENERGY AND NUTRIENTS BY ADOLESCENT GIRLS BEFORE AND AFTER THE COMMUNITY KITCHEN INTERVENTION IN INTERVENTION AND CONTROL COMMUNITIES

	INTERVENTION		CONTROL	
	Pre	Post	Pre	Post
n	71	65	50	42
Energy *** Kcal/day	1340 ±391	1643 * ±506	1355 ±372	1387 ±326
Protein *** g/day	37.1 ±13.1	46.9 * ±15.9	37.2 ±10.7	40.3 ±10.8
% Animal protein	25 ±15	31 * ±14	25 ±12	28 ±10
Total Iron mg/day	7.75 ±3.5	9.42 * ±5.0	8.0 ±2.7	8.16 ±4.0
Haem Iron ** mg/day	0.60 ±0.54	0.96 ±1.59	0.61 ±0.59	0.54 ±0.46
Available Iron ** mg/day	0.55 ±0.32	0.71 ±0.62	0.52 ±0.26	0.50 ±0.29
Ascorbic acid *** mg/day	44 ±39	67 * ±45	38 ±33	40 ±28

*Pre vs Post: p=<0.001 **Post:Interv vs Cont, p=<0.05 ***Post:Interv vs Cont p=<0.01

Table 12

CALCULATION OF AVAILABLE IRON*

For Individuals who are Non-Anaemic but Iron Depleted

Availability Factor:

VITAMIN C mg/1000 Kcal	Meat, Fish, Poultry Protein g/1000 Kcal		
	<9	*9-27*	*>27*
<35	5%	10%	15%
35 - 105	10%	15%	15%
>105	15%	15%	15%

Algorithm:

Available Iron: Haem iron x 0.25 + (non-haem iron x availability factor x tea factor)

*Suzanne Murphy et al. AJCN 1992;56:565-72

Table 13

FREQUENCY OF CONSUMPTION OF SPECIFI C FOODS BY ADULT WOMEN BEFORE AND AFTER THE CAMPAIGN IN INTERVENTION AND CONTROL COMMUNITIES

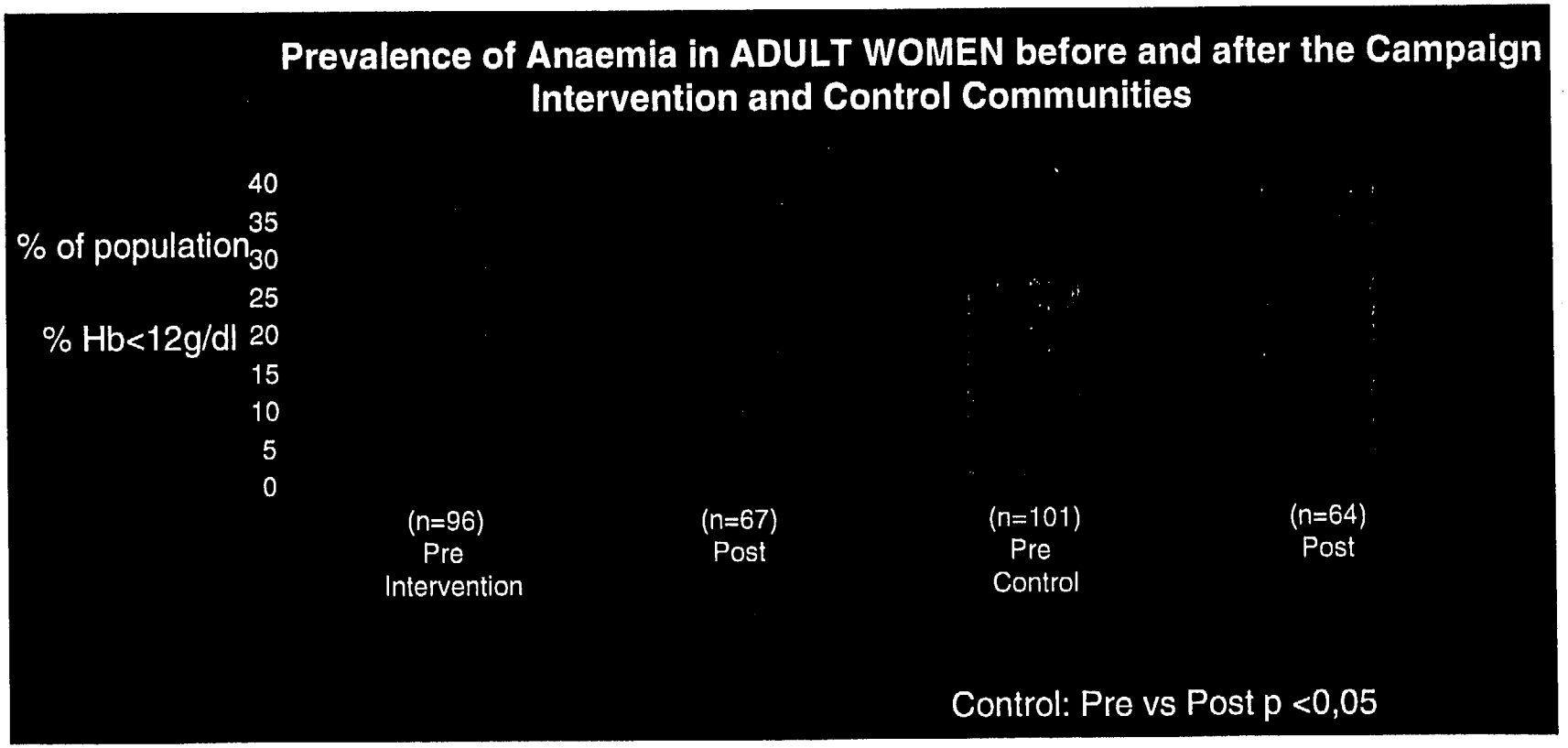
	PERCENTAGE OF POPULATION					
	INTERVENTION			CONTROL		
	Pre	Post	p	Pre	Post	p
Beef: Liver, Heart, Lung Daily-weekly	16	43	<0.01	25	38	
Chicken Liver Daily-weekly	58	65		58	56	
Blood pudding Daily-monthly	20	35		14	12	
Oranges Daily-weekly	50	71	<0.01	65	74	<0.01
Lentils Daily-weekly	68	88	<0.01	63	76	
Coffee/tea/herbs Daily-weekly	71	69		67	74	

Table 14

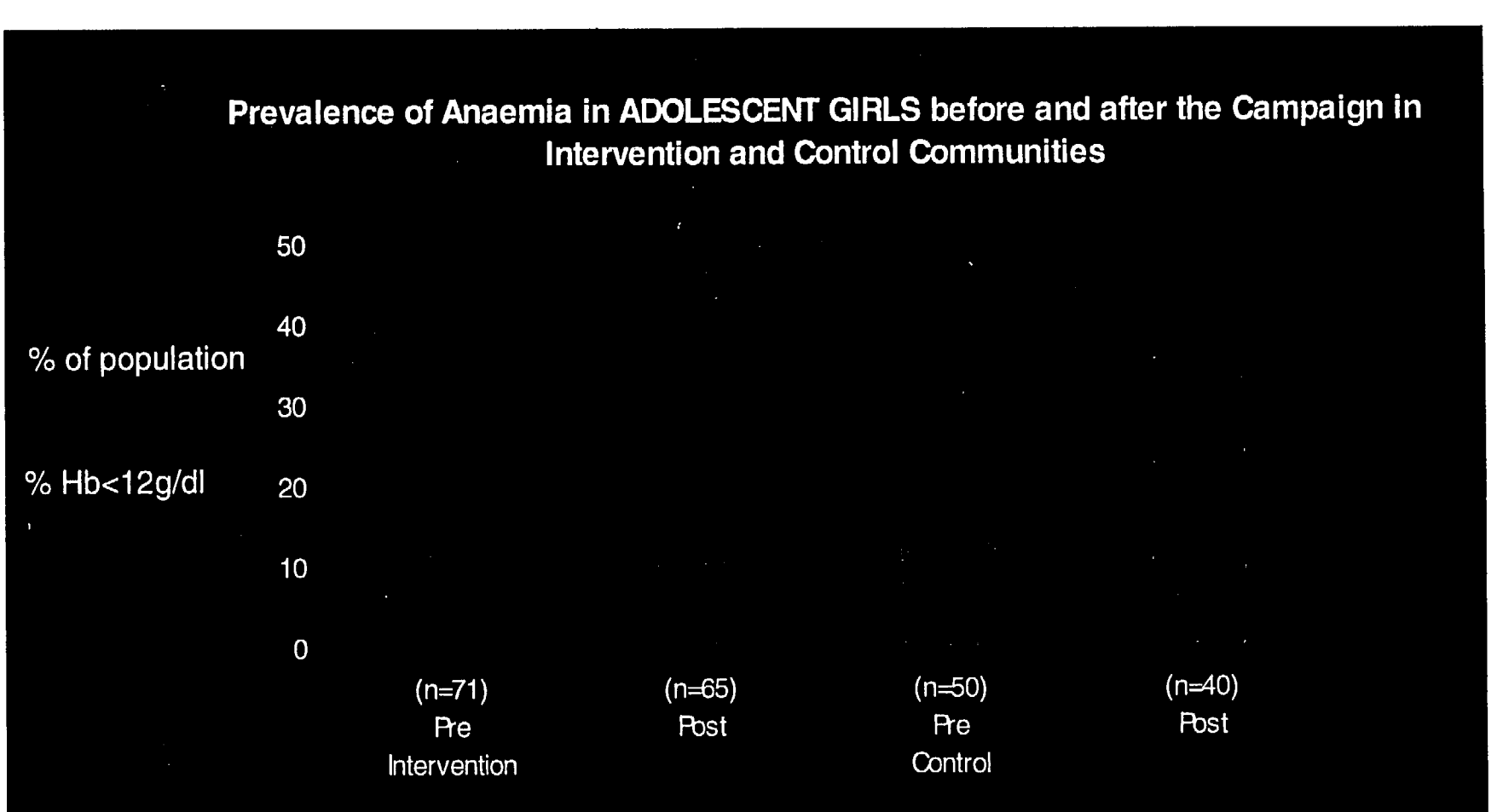
FREQUENCY OF CONSUMPTION OF SPECIFI C FOODS BY ADOLESCENT GIRLS BEFORE AND AFTER THE CAMPAIGN IN INTERVENTION AND CONTROL COMMUNITIES

	PERCENTAGE OF POPULATION					
	INTERVENTION			CONTROL		
	Pre	Post	p	Pre	Post	p
Chicken Liver						
Daily-weekly	55	68		56	60	
Blood pudding						
Daily-monthly	24	40		8	5	
Oranges						
Daily-weekly	59	83	<0.01	52	81	<0.01
Lentils						
Daily-weekly	56	77	<0.01	52	55	
Beans						
Daily-weekly	59	66		72	69	
Coffee/tea/herbs						
Daily-weekly	82	78		70	79	

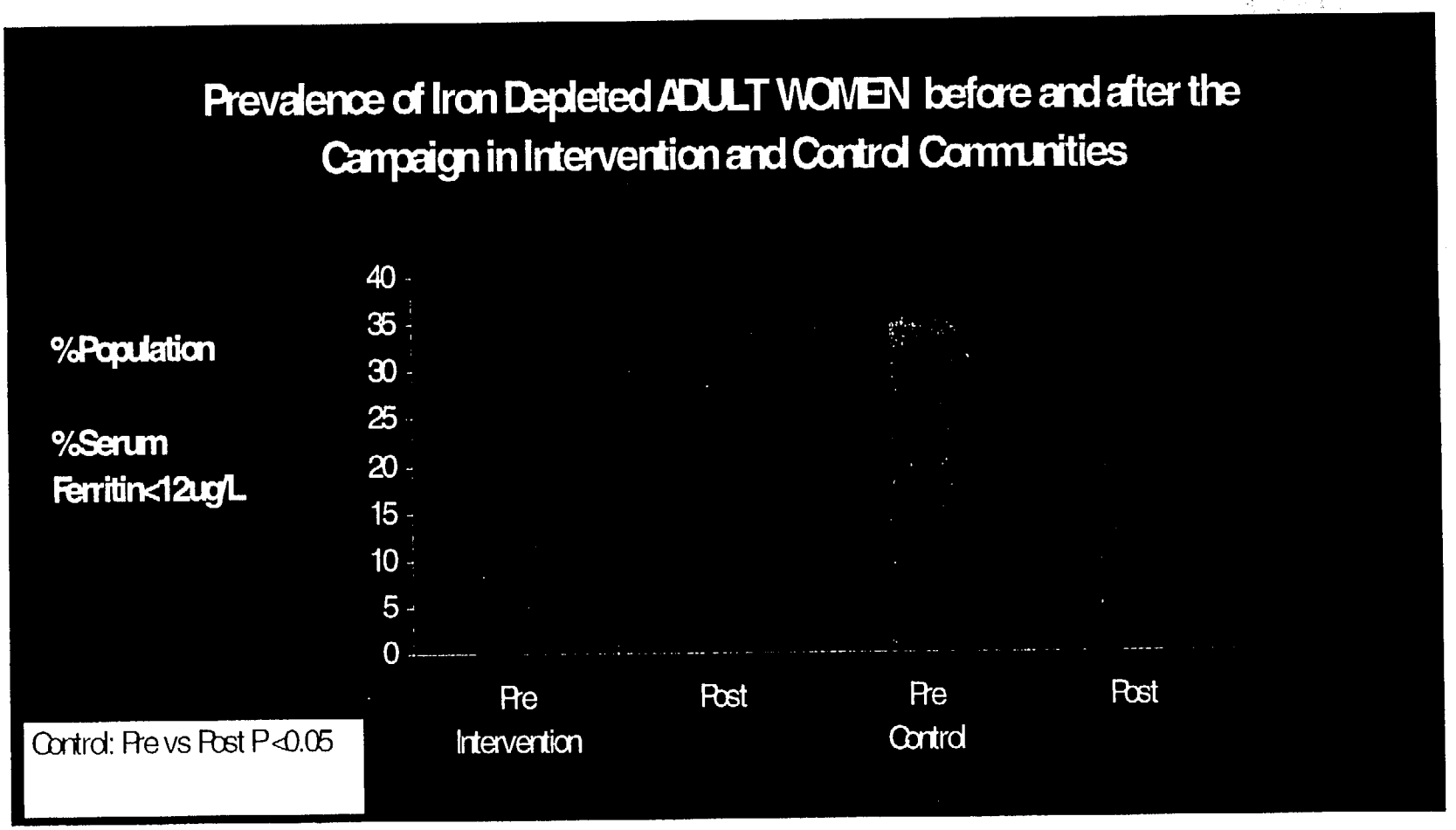
Graph 1


Prevalence of Anaemia in ADULT WOMEN before and after the Campaign
Intervention and Control Communities
% of population
% Hb<12g/dl
40
35
30
25
20
15
10
5
0
(n=96) Pre Intervention
(n=67) Post
(n=101) Pre Control
(n=64) Post
Control: Pre vs Post p <0,05

Graph 2


Prevalence of Anaemia in ADOLESCENT GIRLS before and after the Campaign in Intervention and Control Communities
% of population
% Hb<12g/dl
50
40
30
20
10
0
(n=71) Pre Intervention
(n=65) Post
(n=50) Pre Control
(n=40) Post
Control: Pre vs Post P <0,01

Graph 3


Prevalence of Iron Depleted ADULT WOMEN before and after the Campaign in Intervention and Control Communities
%Population
%Serum Ferritin<12ug/L
40
35
30
25
20
15
10
5
0
Pre
Post
Pre
Post
Intervention
Control
Control: Pre vs Post P<0.05

Graph 4

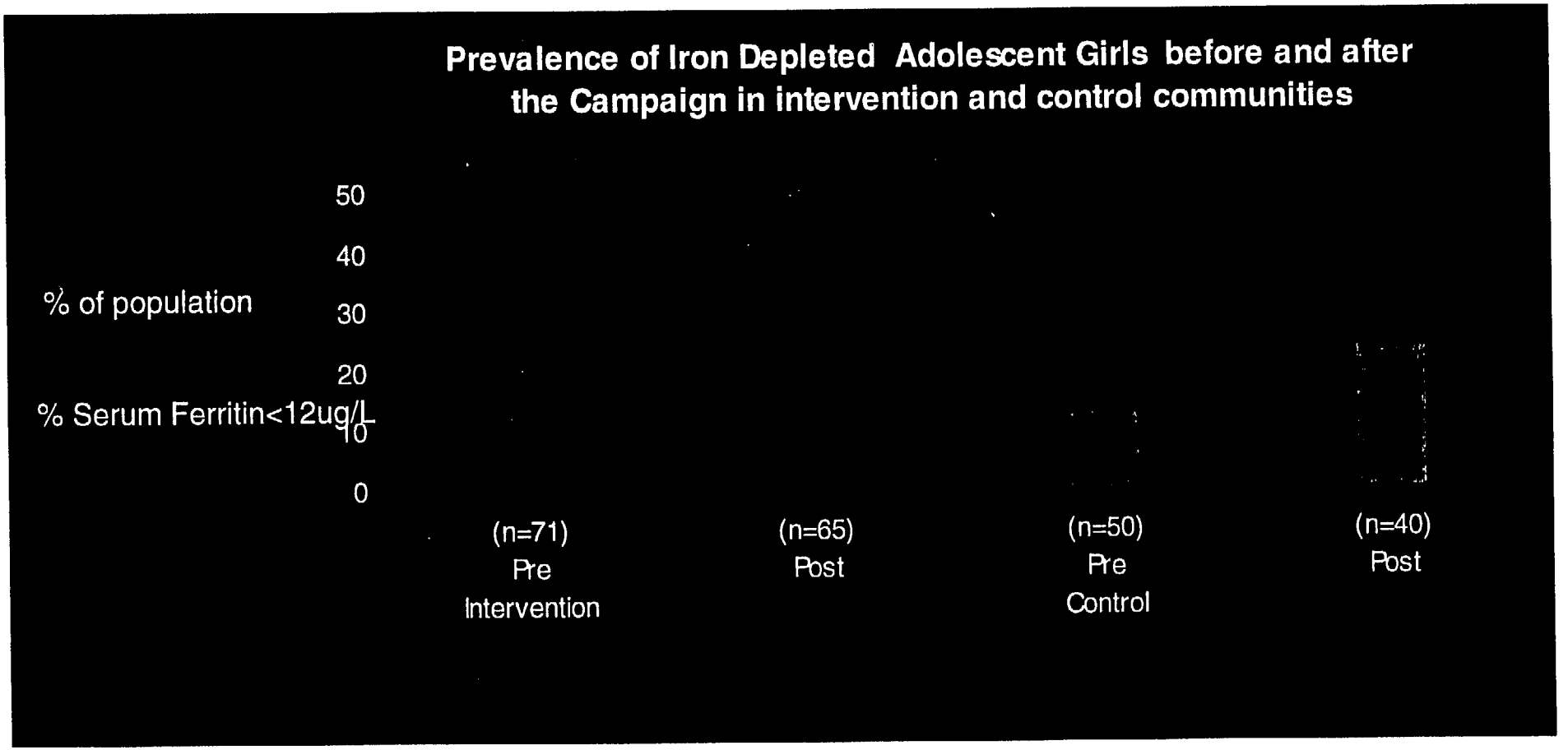
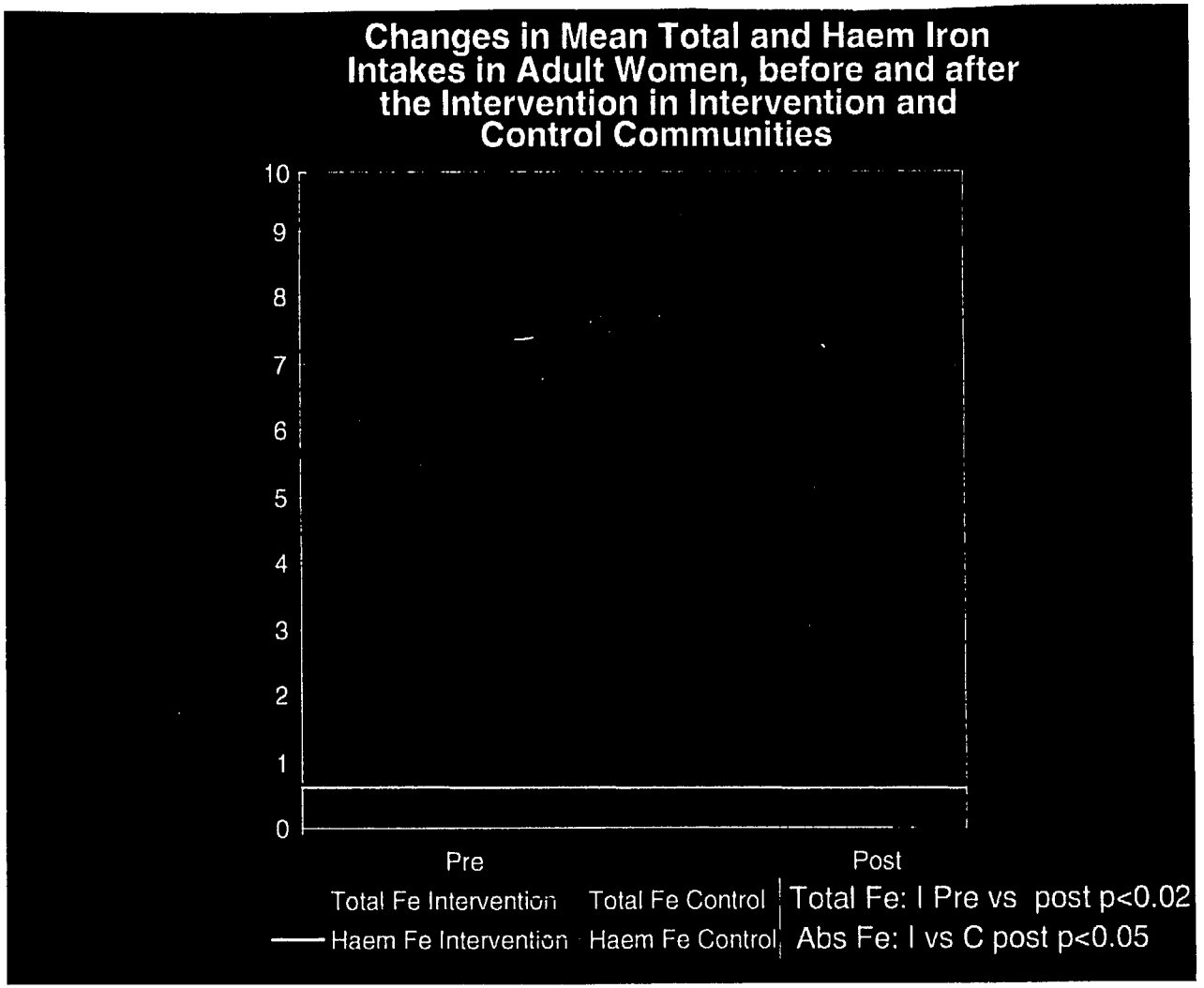
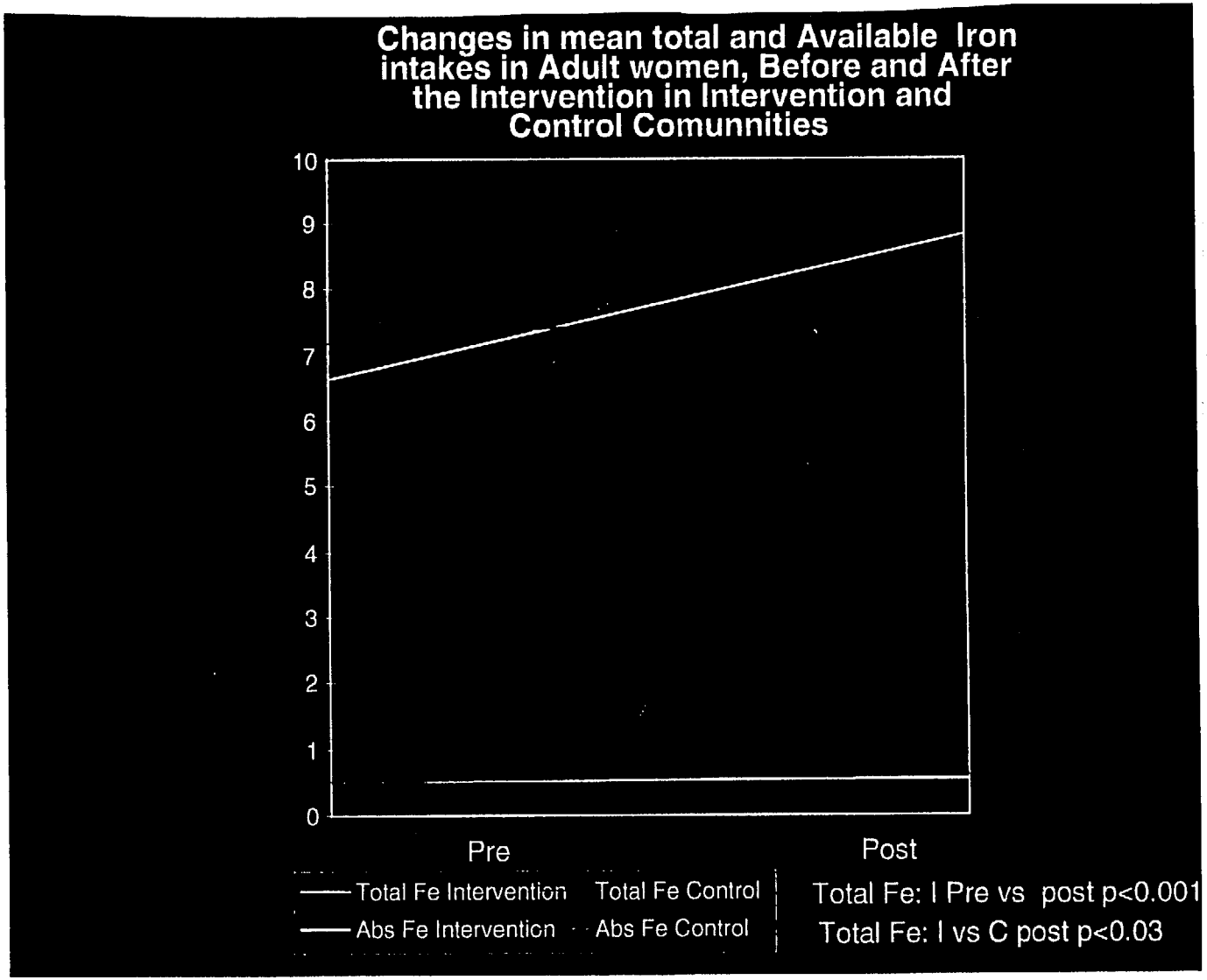
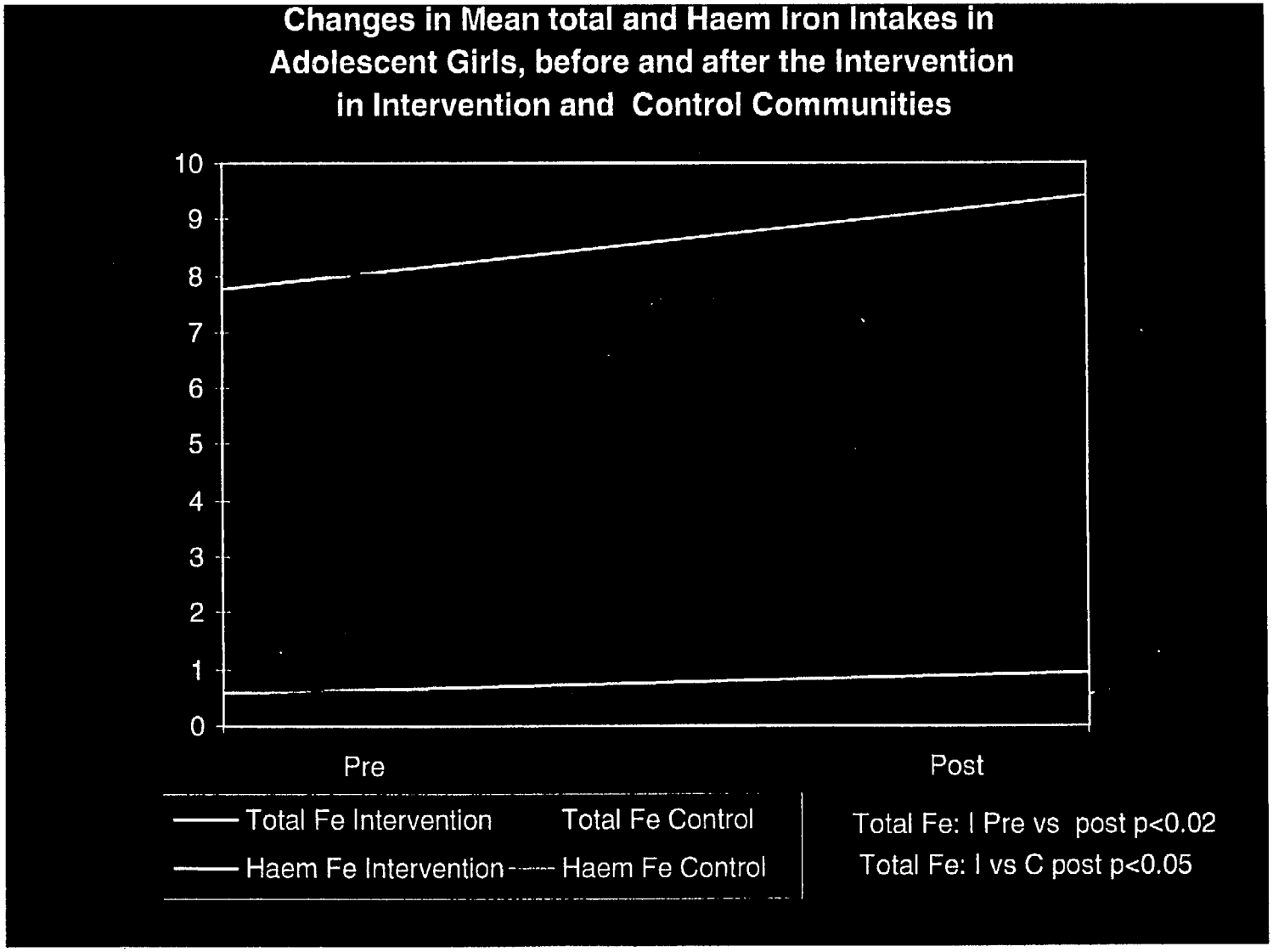
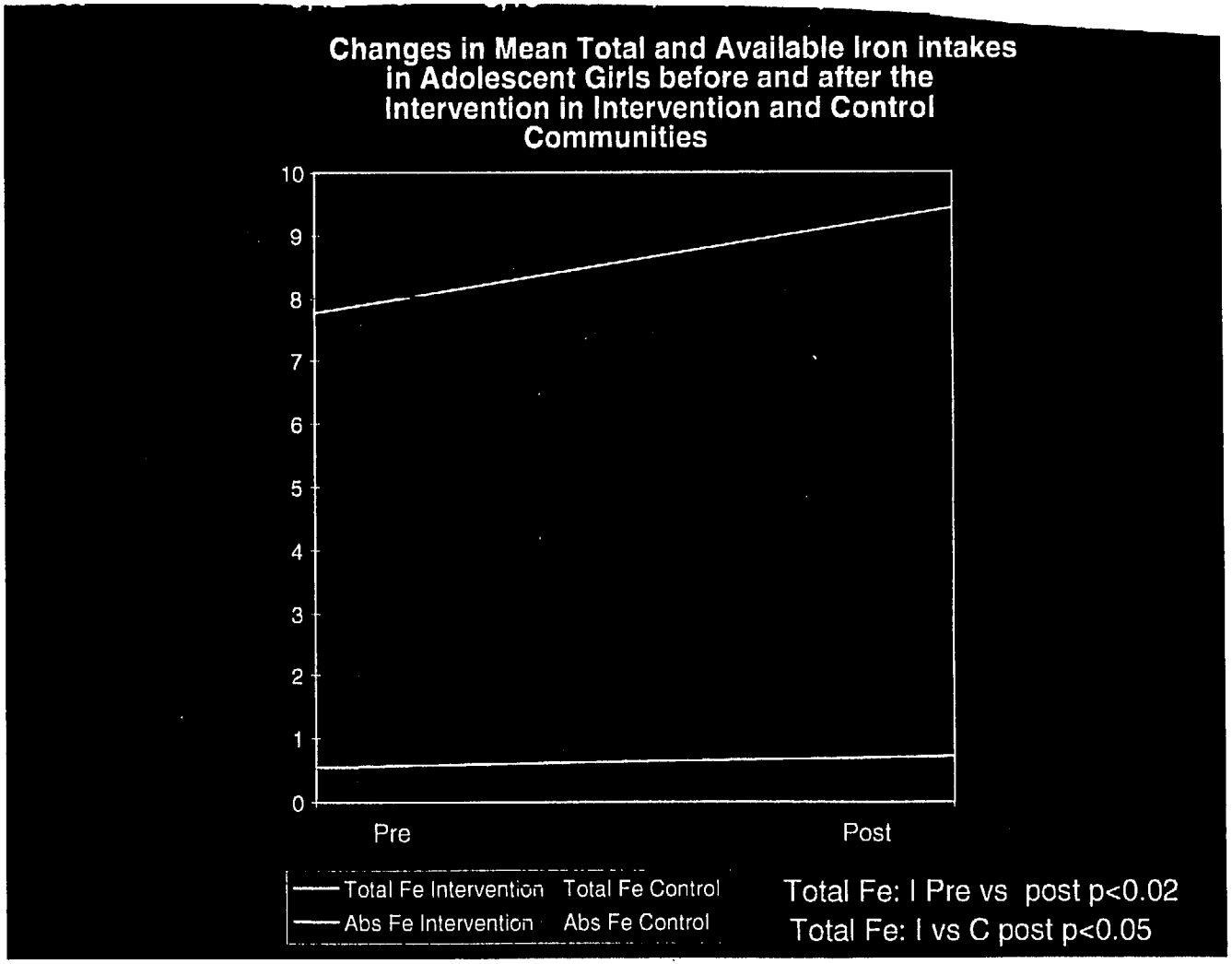

Prevalence of Iron Depleted Adolescent Girls before and after the Campaign in intervention and control communities
% of population
% Serum Ferritin<12ug/L
50
40
30
20
10
0
(n=71) Pre Intervention
(n=65) Post
(n=50) Pre Control
(n=40) Post

Figure 1


Changes in Mean Total and Haem Iron Intakes in Adult Women, before and after the Intervention in Intervention and Control Communities
10
9
8
7
6
5
4
3
2
1
0
Pre
Post
Total Fe Intervention
Total Fe Control
Haem Fe Intervention
Haem Fe Control
Total Fe: I Pre vs post p<0.02
Abs Fe: I vs C post p<0.05


Changes in mean total and Available Iron intakes in Adult women, Before and After the Intervention in Intervention and Control Comunnities
10
9
8
7
6
5
4
3
2
1
0
Pre
Post
Total Fe Intervention
Total Fe Control
Abs Fe Intervention
Abs Fe Control
Total Fe: I Pre vs post p<0.001
Total Fe: I vs C post p<0.03


Changes in Mean total and Haem Iron Intakes in Adolescent Girls, before and after the Intervention in Intervention and Control Communities
10
9
8
7
6
5
4
3
2
1
0
Pre
Post
Total Fe Intervention
Total Fe Control
Haem Fe Intervention
Haem Fe Control
Total Fe: I Pre vs post p<0.02
Total Fe: I vs C post p<0.05


Changes in Mean Total and Available Iron intakes in Adolescent Girls before and after the Intervention in Intervention and Control Communities
10
9
8
7
6
5
4
3
2
1
0
Pre
Post
Total Fe Intervention
Total Fe Control
Abs Fe Intervention
Abs Fe Control
Total Fe: I Pre vs post p<0.02
Total Fe: I vs C post p<0.05