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THE EFFECT OF NEONATAL JAUNDICE REQUIRING TREATMENT ON THE SUCCESS OF BREASTFEEDING IN NEWBORNS

by

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ABSTRACT

This study was undertaken to test the hypothesis that neonatal jaundice requiring treatment decreases the success of breastfeeding in newborns. Two groups of mother-child pairs were determined: the treatment group consisted of pairs in which the infant had undergone phototherapy (n=37) and the no-treatment group consisted of pairs in which the infants had not been treated with phototherapy (n=40).

The mothers were enrolled approximately two days after the birth of their babies. Information was collected from the medical records of the infants and the mothers were interviewed at this time. Then they were followed for six months. The follow-up involved a home interview approximately one week after mother and baby had returned home, a phone interview when the baby was six weeks old and a mailed card at six months to be returned to the researcher.

Data collected from the medical records and the structured interviews included sociodemographic information, factors which could influence the duration of breastfeeding, feeding routines of the infants, treatment regimes and information on the success criteria.

Some differences were found in the feeding routines of the two groups. The babies under the phototherapy lights had approximately one less feed per day, they were fed more on a schedule than on demand and, when supplemented, the supplements were given more frequently.

The criteria for "successful breastfeeding" were: (1) the duration of breastfeeding, (2) premature discontinuation of breastfeeding, (3) problems during the breastfeeding experience and (4) a subjective rating by the mothers of the breastfeeding experience. Overall there was no difference in these criteria between the two groups. However, it is to be noted that 50.6% (n=39) of the total sample were still breastfeeding at six months, of the total number of women on whom there was sufficient information 39.6% (n=21) stopped breastfeeding prematurely, the numbers and types of problems were varied and the women were very satisfied with their breastfeeding experience.

Therefore, neonatal jaundice requiring treatment did not decrease the success of breastfeeding, and breastfeeding as a whole was successful for this group of mothers.

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CHAPTER 1

LITERATURE REVIEW

Hyperbilirubinemia is an increase in the amount of bilirubin in the blood. The main source of bilirubin is the destruction of circulating red blood cells; it is the final breakdown product of heme, which is a constituent of haemoglobin and non-haemoglobin proteins (1,2). Bilirubin is bound to albumin in the blood and it is then transferred to the liver where it is conjugated via the action of glucuronyl transferase. Conjugated bilirubin is then excreted into the bile canaliculi and then into the small intestine (1-4).

Normally, some of the conjugated bilirubin is reduced by intestinal bacteria to urobilin which is absorbed and eventually excreted in the urine. However, in the newborn's intestine B glucuronidase deconjugates the bilirubin, which is then reabsorbed into the blood stream via the intestine; this process is termed enterohepatic circulation. The meconium of the newborn sometimes contains a large amount of unconjugated bilirubin. If the meconium passage is delayed, which may occur, for example, when breastfeeds are infrequent (5), the amount of bilirubin in the enterohepatic circulation increases (1-4).

When the bilirubin levels in the blood are high it is deposited in the subcutaneous adipose tissue or in the sclerae. The resulting yellow discolouration of the skin, the mucosae, certain body fluids and the sclerae of the eyes, is called jaundice (4,6). Chemical hyperbilirubinemia (serum bilirubin of 34umol/l or more) is present in virtually all infants during their first week of life (1,7,8), but not all of them will have levels sufficiently elevated to cause visible jaundice. Visible jaundice does not occur in the newborn until the serum bilirubin reaches 100-120 umol/l (4,9). Neonatal jaundice is the most common disorder requiring treatment during the neonatal period (4,10). Estimates of the prevalence of jaundice range from 4.5-60% of term infants, depending on the definition of jaundice i.e. what level of bilirubin was used or whether only visible jaundice was included, and on the race of the infant (4,8,9,11-14).

The reason for concern over the levels of bilirubin in the newborn is that in high concentrations it is a neurotoxin. Sequelae only occur, though, with very high bilirubin levels or if an infant is very susceptible to high levels, and so are rarely seen, given modern methods of neonatal care. The mechanism of the toxicity, however, is not clearly understood. The clinical toxicity of bilirubin during neonatal life is termed kernicterus; it pathologically shows yellow staining in

nuclear areas of the brain (3). The first clinical manifestations of bilirubin toxicity include a decrease in activity, irritability and a loss of interest in feeding. Then within several hours the symptoms may include rigid extension of all four extremities, a high pitched irritable cry, seizures and gastric haemorrhage. This may lead to death or, if it does not, the infant may then experience neurological effects, such as a loss of muscle tone, difficulty in feeding and, at a later date, oculomotor paralysis, high frequency hearing loss and mental retardation. If the infant was only moderately jaundiced then any effects are only very minor by the time the child is 7-10 years old (1,3,9,15,16). Kernicterus in healthy, full term infants is rarely seen now (15,16). Apart from the risk of kernicterus, there has been concern that even moderate levels of bilirubin might produce subtle neurological damage. However, there seems to be insufficient evidence to support this and any potential effects probably would not extend into early childhood (16-22).

Jaundice may occur for physiological or pathological reasons. Physiologic jaundice is due to a combination of excessive bilirubin production and deficient hepatic conjugation (4). The excessive bilirubin load presented to the neonatal liver comes from high haemoglobin levels, increased red cell mass, a shortened red cell survival and an

increase in the enterohepatic circulation of bilirubin. The impaired hepatic conjugation is due to a transient glucuronyl transferase deficiency in the newborn's relatively immature liver. Another factor which may contribute to the jaundice is a deficiency of ligandin, which is a bilirubin binding protein in the hepatic cells. A deficiency of this protein can lead to decreased bilirubin uptake from the plasma and so the plasma levels remain high (1,4,8,23). Physiologic jaundice in the healthy, full-term infant peaks around day three and the bilirubin level then subsides by around the fifth day (13).

Breastfeeding is also known to play some role in the aetiology of neonatal jaundice, but the extent of this is unclear and the true incidence of jaundice caused primarily by breastfeeding is probably very low (4,10,12-14,15,19,23-31). In this case the bilirubin levels rise after the infant starts taking its mother's milk and peaks later than for physiologic jaundice, possibly not until day 10 to day 15. It also takes longer for the levels to decline to baseline levels; this may not occur until week 3 to 12 (4,32). Mechanisms by which breast milk is thought to have its effect have been suggested, such as an inhibitory effect of pregnanediol on glucuronyl transferase or a relative caloric deprivation, which may cause decreased hepatic ability to extract bilirubin from the blood, so decreasing the hepatic clearance of bilirubin and resulting

in an increased serum concentration of bilirubin (10). However, this matter remains unclarified (33-35).

As stated, jaundice may also occur due to pathologic factors which can increase bilirubin production or decrease its excretion. Haemolytic diseases cause an increase in bilirubin production; blood group incompatibility between the mother and infant accounts for the majority of the cases of haemolytic disease seen in infants. Other factors which increase bilirubin production include marked bruising and infection. Impaired bilirubin excretion may be due to bowel obstruction, decreased caloric intake or delayed passage of the meconium (4).

Criteria for the treatment of neonatal jaundice are not consistent among hospitals or among physicians, but the most frequently used and successful treatment is phototherapy (4,9,36,37). Reports of the current usage of phototherapy vary from 2-6% of all infants (38-40), although data from an unpublished audit indicate that present hospital practices may involve as many as 29% of all infants being treated with phototherapy (41). Not all infants with neonatal jaundice are treated with phototherapy, as their bilirubin level may not be sufficiently elevated to be judged by the physicians as warranting treatment. A small percentage of the infants with jaundice may be treated with exchange transfusions.

In the late 1950's, irradiation of the skin with visible light was first used by Cremer et al as a treatment for hyperbilirubinemia (42). Cremer and his colleagues had followed up on an observation that infants kept close to windows developed less jaundice and that jaundiced babies exposed to sunlight improved rapidly. In the following years there were many reports of the successful use of phototherapy in Europe and South America (16). However, it was not generally accepted in North America until the late 1960's, probably because initially there were concerns about its effectiveness and the toxicity of possible photodecomposition products despite reports in the literature to the contrary. In 1968 Lucey published a report on a controlled trial of phototherapy used prophylactically on premature infants demonstrating the effectiveness of the treatment in preventing the development of hyperbilirubinemia (43). However, it was stated that there were no good follow-up studies at that point. From the late 1960's onwards, though, the dissemination of phototherapy was wide and it became a well established treatment regime.

Phototherapy units now consist of banks of fluorescent lights or lamps with tungsten-halogen bulbs. The infants are placed at a specific distance (35-40cm) from the lights. They are virtually naked, as the effectiveness of phototherapy

is related to the area of skin surface exposed (9). The infants also have eye patches on to prevent any damage to the eyes. Continuous phototherapy is primarily used, because intermittent phototherapy has generally been shown to be less effective (9,44). For the first twelve to twenty-four hours of phototherapy, the bilirubin levels tend to be stabilised rather than lowered abruptly. The overall length of time infants are under the phototherapy lights varies according to how quickly the treatment reduces the bilirubin level to that at which the physician judges there to be minimal risks on discontinuing therapy. Therefore, treatment is usually for at least twenty-four hours, but it may be for several days (23,39,45).

Despite the widespread use of phototherapy its mechanism is still not certain. It acts in the skin and frees the unconjugated bilirubin from the collagen and lipoproteins to which it is bound; the decrease in the bilirubin level is proportionately greater in the skin than in the serum during phototherapy (9). Several photochemical reactions of bilirubin have been found to occur in vivo during phototherapy; the most rapid is conversion of bilirubin to isomeric forms, which involves a modification of some internal bonds of the bilirubin molecules without changing its chemical constitution. These isomers, often called photobilirubins, are water soluble and readily excretable in bile via the liver

without the need for hepatic conjugation (38). The isomerization is rapid but unstable, so that the photobilirubins quickly revert back to natural bilirubin in bile (2). It is thought that such photoisomerization is the primary mechanism by which phototherapy serves to reduce the concentration of bilirubin (8,9,23,36). The isomers are less lipophilic and may, therefore, also be less toxic too, which would be another immediate beneficial effect of phototherapy (2).

Phototherapy has been found to be effective in controlling hyperbilirubinemia in infants weighing more than 2000g. and who do not have a haemolytic disorder (45). It is also sometimes used to prevent hyperbilirubinemia from occurring in infants of low birthweight, such as less than 2000g., even in the presence of haemolysis (9,45). Phototherapy decreases the numbers of exchange transfusions required and has a smaller rebound effect on cessation of treatment than exchange transfusions (46). Only in very severe cases of jaundice is exchange transfusion utilised and even then phototherapy is usually used before and after the exchange transfusion.

The evaluation of phototherapy is still underway. Areas of debate include a consideration of the most effective range of wavelengths for lowering serum bilirubin levels. Only a

small fraction of the light absorbed by the bilirubin molecule is successful in isomerizing these molecules. The probability that the light will be absorbed in the first place seems to be highly dependent on the wavelength of the light (38). The region of maximum light absorption by the bilirubin molecule is between 430 and 465 nm, but wavelengths of less than 450nm are potentially carcinogenic (23,38).

Therefore, suggested wavelengths have generally been greater than 450nm (38), although potentially the most efficient wavelengths include those less than this (15,23,38,47). As Cashore and Stern point out (15,23), to have a narrow spectral band of the "blue" region produces an intense blue light over the infant. This can be uncomfortable to the eyes of nursery personnel during phototherapy and hampers observation of the baby (3,36). Therefore, a slightly wider spectral band is generally used to produce a white light, but with the light intensity concentrated in the blue region. However, the blue lamps may cause a faster decrease in bilirubin levels than lamps of broad spectral distribution (47). Green light (approximately 525nm) has also been suggested to be an efficient light source (48), but this has been challenged (38).

The efficiency of the light source also varies with the age of the bulb. A decrease in the energy emitted occurs

before the light burns out and this decrease is different with the type of light being used.

Another major debate has been touched on earlier and it concerns the criteria for treatment of hyperbilirubinemia, specifically at what bilirubin level phototherapy should be initiated. It has been suggested that healthy, term infants with non-haemolytic hyperbilirubinemia may well not be started on phototherapy until the bilirubin level reaches approximately 200-250 umol/l (7,9,36,43). However, other factors need to be considered with this decision, such as the postnatal age of the infant, the rate of rise of the bilirubin level and the gestational age of the infant. It appears that the pressure is on the physician to prevent the serum bilirubin from reaching 340umol/l i.e. 20mg/100ml, which is why this has been termed "vigintiphobia", which means a fear of twenty (49). Even this level, though, has been questioned, as it was arrived at from studies thirty years ago on full term babies with haemolytic disease and was then applied to infants without haemolytic disease (9,16,50,51).

There is some evidence that phototherapy may be safely witheld until much higher bilirubin levels than are generally accepted. When Lewis et al (39) investigated the need for and effects of phototherapy in full term, otherwise healthy babies with physiological jaundice, their results suggested

that treatment may be safely withheld until serum bilirubin exceeds 320umol/l without adverse effects. If adopted, this policy would greatly reduce the number of babies treated with phototherapy. This, in turn, would reduce the number of infants exposed to any potentially adverse effects of phototherapy. However, this level is not generally accepted and treatment usually starts at levels of 200-250 umol/l as previously mentioned.

The use of phototherapy in the home setting is also being assessed. This is an important alternative to consider, because mothers and their infants may go home on day two and, as jaundice often develops around day three, there is the possibility of an infant being rehospitalised. There are two immediate advantages to treating the infant at home: firstly, the lower cost involved and secondly, the avoidance of parent-child separation. Slater et al (52) compared home and hospital phototherapy. Both treatments were effective and no complications due to the phototherapy occurred in the home group. Other physicians have also found home phototherapy to be safe, feasible, effective and well-accepted (53,54). In these instances the infants were selected carefully to screen out those who would potentially need more rigorous care.

Phototherapy should be discontinued when the bilirubin level is falling progressively and is at a safe level. This

is generally considered to be about 200 umol/l i.e. below that at which it is suggested that treatment be initiated. It is left to the physician to judge when there is little risk of the bilirubin returning to a dangerous level before phototherapy is discontinued. This judgement is based on the age of the infant and its clinical condition, as well as the bilirubin level (4,9,36).

It is important to consider the criteria for initiating and discontinuing phototherapy, as there are several well-documented clinical complications that have been associated with phototherapy. Therefore, it makes sense to avoid unnecessary treatment, even if they are only reversible short-term effects. These effects do not, in fact, occur very frequently. These complications together with their proposed mechanisms include: (1) tanning caused by the induction of melanin synthesis from ultraviolet absorption, (2) bronze baby syndrome, in which the infant develops a brownish discolouration of the skin, urine and serum, due to the polymerization of circulating porphyrins; it seems to only develop when there is also hepatic dysfunction, (3) diarrhoea brought on by bilirubin induced bowel secretion or lactase deficiency, (4) lactose intolerance due to mucosal injury of the villous epithelium, (5) haemolysis due to photosensitized injury to erythrocytes, (6) skin burns from excessive exposure to short-wave emissions from the fluorescent lamps, (7)

dehydration because of increased insensible water loss from the skin due to an increased blood flow and (8) skin rashes brought about by photosensitized injury to skin mast cells with the release of histamine (3,9,36,55,56). Other potential changes include: a reduced platelet count, abdominal distension, hypocalcaemia and lowered riboflavin levels (8,9,36).

With respect to growth and development, there is a temporary slowing of growth during phototherapy with a catch-up period once it has been discontinued (36). There is also evidence of a poorer short-term orientation performance of those infants treated with phototherapy (57-59). Orientation performance includes responding to verbal and visual stimuli, such as following a human face. At three years of life, however, no differences were found in growth or development between a group of infants who had received phototherapy during the first week of life and a control group (9,60). In other words, it seems unlikely that phototherapy causes any harmful longterm effects provided that the eyes are shielded (36).

Breast feeding may be temporarily stopped during treatment for the jaundice and this is generally thought to cause the bilirubin level to decrease faster than if breastfeeding is continued (15,34). This is because of the

previously mentioned association between breastfeeding and neonatal jaundice. It has been recognized by some, however, that a temporary cessation of breastfeeding may lead to complete discontinuation (13,61-63). Even if breastfeeding is not temporarily stopped, it has been realised that mother-infant separation in the first few days of life may interfere with breastfeeding. It seems that without early and frequent contact between mother and baby it is difficult to establish breast feeding (64). In fact, it has been found that a short mother-infant separation after birth decreases the duration of breastfeeding, even with breastfeeding continued during the separation period (65). Early and frequent contact have also been associated with an increase in the duration of breastfeeding (66,67).

One of the most widespread difficulties with breastfeeding is a poor let-down reflex (68). The let-down reflex occurs when the milk is ejected from the collecting ductules into the main milk sinuses under the nipple and is, therefore, readily available for the nursing infant. A poor let-down reflex is frequently caused by adverse maternal psychological factors, such as stress, anxiety and emotional upset (69). These factors may be due to several reasons: for instance, a belief that her own milk is or will be inadequate for her baby (70), the infant being ill, particularly if the illness is perceived as serious by the mother or treatment

that the infant is receiving if it is disturbing to the mother. Therefore, a baby with neonatal jaundice undergoing phototherapy may cause the mother a great deal of stress (58,59), which in turn may inhibit the let-down reflex. This may aggravate the mother's difficulties with breastfeeding and increase the stress.

Therefore, to summarise the two above points, the treatment for neonatal jaundice may disrupt contact and cause stress, which may adversely affect the mother and child in establishing a successful breastfeeding routine.

One of the potential causes of stress mentioned was the belief that her own milk is or will be inadequate for her child. It is accepted that there may be times during the mother's breastfeeding experience when she does, in fact, experience a period when she seems to have insufficient milk. This has been termed a "lactational crisis" by some authorities (71). In the study by Verronen (71), lactational crises were related to the duration of breastfeeding and 44% of the mothers in the study felt that lactational crises were connected with emotional upsets or tiredness of the mother. There may, therefore, be a chain of events here: an infant has neonatal jaundice and is treated with phototherapy; this causes the mother stress; which may cause lactational crises; which may lead to cessation of breast feeding.

The reasons mothers give for discontinuing breastfeeding are varied. They generally fall into two categories: (1) lactational and (2) external reasons. Lactational reasons include a belief by the mother that she does not have sufficient quantity or quality of milk for her baby, breast problems and the baby refusing the breast. External reasons for stopping breastfeeding often involve a separation of mother and child, as in the mother returning to work or school. Other external reasons could include the mother or infant being ill or the family going on vacation when the mother may feel that it is easier for the baby to be bottle fed (71-75). Some of these reasons could be counteracted by advice from a health care source, as they do not necessarily lead to cessation of breastfeeding; for example, help could be given for breast problems and when the mother feels she has insufficient milk for her infant. The lactational reason of insufficient milk is probably the primary reason for terminating nursing in the first month, whereas between three and six months it is probably the "convenience" factor that leads to mothers stopping breastfeeding (69,76).

There are several other factors that have generally, although not conclusively, been associated with an increased duration of breastfeeding; some of which are potentially modifiable, whilst others are not. Modifiable factors,

besides those previously discussed, include: non-scheduled feeding, social support, a lack of infant formula samples, no formula supplementation, a shorter hospital stay, early contact between mother and child and limited use of medications by the mother (66,67,72,74,76-79). Non-modifiable factors are those such as: an older mother, higher social class, more maternal education, the mother believing herself to have been breastfed and the mother not perceiving difficulties in scheduling breastfeeding on her return to work (67,69,73,75,76,80-85).

The importance of breastfeeding to women is shown by an increase in the proportion of women breastfeeding over the last decade (86,87). In the early 1970's, the percentage of women initiating breastfeeding was around 25-30% (88-90). Breastfeeding rates, as reported in recent Canadian studies, are now 17-85%, with the figures tending to be towards the upper value (82,91-95). The range in the rates may be partly due to differences in definition of what constitutes breastfeeding and differences in when the rates were measured; for example, on leaving hospital or at one month.

The benefits of breastfeeding are well known. There are nutritional, immunological, economic and possibly psychological benefits. Breastfeeding has led to lower infant morbidity, particularly in the areas of

gastrointestinal and respiratory infections (96,97). This is probably due to the control of infections and the avoidance of exposure to allergens. The gut flora of breastfed infants contains a high concentration of lactobacillus which then promotes an acid environment and so prevents the predominance of other gut flora which could result in gut infections (98,99). Breast milk's immunological properties are also due to the presence of factors, such as secretory IgA, lysozyme, lactoferrin and macrophages (98).

The psychological benefits of breastfeeding are under dispute. Some feel that the bonding between the mother and baby cannot be established as well during bottle feeding and this could potentially lead to an increased incidence of child abuse and psychosocial maladjustment in the child, for example (70). Others feel, however, that there is no simple cause and effect relationship between the method of feeding and the nature of the relationship between the mother and baby (64). It may be the way the feeding is done that is important. Also there are many socioeconomic and environmental characteristics that affect the development of the child which are confounding factors when looking at the association between breastfeeding and psychological development (97).

Economics is also a factor to be considered in the benefits of breastfeeding. Comparisons on the relative costs

of breast- and bottlefeeding depend on the foods used by the lactating mother to supply extra nutrients and the type of formula used. However, breastfeeding is still less expensive (70). Other advantages may include good jaw and tooth development and convenience once breastfeeding has been established (68). Therefore, there is an overall consensus that breastfeeding is more beneficial to the infant and mother than bottlefeeding.

RESEARCH QUESTION

There has been little evaluation of the effect neonatal jaundice requiring phototherapy may have on breastfeeding. Therefore, due to this fact, the numbers of infants undergoing phototherapy, the well-documented advantages of breastfeeding and the importance of breastfeeding to many women, this is an important problem to investigate.

Therefore, the object of this research was to consider the impact of neonatal jaundice requiring phototherapy on the success of breastfeeding in newborns. The hypothesis that was tested was: phototherapy for neonatal jaundice decreases the success of breastfeeding.

CHAPTER 2

ISSUES IN BREASTFEEDING RESEARCH

There are several areas in research on breastfeeding in which methodological problems make comparisons of studies difficult and which obscure the conclusions which could be drawn (75,100). These areas need to be addressed in present and future studies. They will be discussed primarily with reference to the present study.

1) Definition of Breastfeeding

Some studies have failed to define exactly what is meant by breastfeeding (27,29,65,69,73,77). There are three major categories of infant feeding: purely breastfeeding, both breast and formula being given and purely bottlefeeding. The latter category is not of concern in this discussion, but the first two are. Even these two categories do not constitute a precise enough definition. The amount of formula an infant receives, as well as being breastfed, may vary from once a week to the majority of the feeds being bottlefeeds, for example. This has implications for comparisons and conclusions, particularly in the areas of duration of and health benefits of breastfeeding. Infants being fed on a mixed regime usually have to be included in one definition of

breastfeeding, as supplementation is a frequent occurrence from birth or during the period of a study.

If subjects are classified on the basis of their feeding regime into too few groups the definition of these groups becomes very loose and information may be lost. On the other hand, too precise a definition which leads to several groups may make analyses unwieldly and create the need for very large sample sizes.

Therefore, the definition of the groups should be in terms relevant to the population being studied and to the research question. Therefore, in the present study breastfeeding was defined as being such when more than half of the infants' feeds were breastfeeds after the first twenty-four hours of life. This was a necessary definition as virtually all infants were found to be supplemented to some degree in the hospital, particularly those under phototherapy. Also, during the initial twenty-four hours many infants received formula frequently, particularly if their mothers were tired or sleeping. With respect to the research question it was felt that breastfeeding could still be termed successful even when supplements were being given.

2) Length and Frequency of Follow-up

If interviews require the mother to recall events over a long period in the past then the information is subject to recall bias. It may also be presented in socially acceptable forms, such as the time of introduction of solids being stated as later than was actually the case. The three interviews in the present study related back only to a maximum of about four weeks. Therefore, the problem of recall bias was less than if the recall period had been longer i.e. more than approximately one month, which is often the case in other studies (65,67,69,71,73,76-78,81,83).

The length of follow-up depends on the research question. For example, when looking at health benefits of breastfeeding the researcher may want to look at benefits conferred if the mother breastfeeds for only one month or for six months. Or the researcher may wish to know the full duration of breastfeeding, in which case subjects need to be followed until they stop breastfeeding. In this study the initial duration was six weeks for two reasons: (1) convenience and (2) it was thought from the literature that many women would have stopped breastfeeding by this time. However, it was then extended to six months as it was found that not enough women had stopped breastfeeding by six weeks for the analyses of differences between the groups, in duration of

breastfeeding and in the numbers who had discontinued prematurely, to be done.

3) Comparison Populations

The composition of the comparison population also depends on the research question. Ideally, the comparison population is different only in respect to the factor under consideration. Any potential or actual differences between the comparison and study populations can possibly be dealt with by stratification of the sample at the beginning of the study or in the data analysis and/or presentation. One reason why there may be differences between the study and comparison populations is that there may be intrinsic differences between different feeding groups. This is due to the lack of random allocation to different feeding practices i.e. the mothers select their own method of feeding. For example, those mothers who breastfeed may be better educated, more affluent and have better access to health care.

Therefore, one must be able to measure any factors which potentially affect the outcome. For example, if one is studying morbidity in different feeding groups this may be affected by the living conditions of the family which are dependent on their socioeconomic status and this may also affect which method of infant feeding they choose.

Therefore, any differences in morbidity could be due either to the feeding method or to the socioeconomic status.

Confounding factors should, therefore, be measured, but when historical data is being used for the comparison population it is not always feasible to do so. It can be done, however, more easily in prospective studies. In the present study, information on the factors which were thought, from the literature, to affect the success of breastfeeding, particularly its duration, was collected during the interviews and compared between the two populations. This was done so that if any differences were found in this data they could be adjusted for in the analysis and/or presentation. In order to answer the research question the only difference that would not be adjusted for was whether or not the infants received phototherapy.

4) Sample Size

Some of the sample sizes in the literature are quite small i.e. approximately fifty or less (5,33,84,101). The analysis can then be problematical, especially if, within this total sample, there are several analytic groups. If the sample is stratified finely i.e. there is an attempt to control for multiple variables, then a large sample size is required. This could be very costly and time consuming.

The sample size of the present study was based on the potential differences in two of the criteria of interest that might be detected between the two groups. Time constraints were also taken into consideration i.e. the length of time it would take to collect and follow a large sample.

CHAPTER 3

METHODS

In order to evaluate any effect of jaundice requiring phototherapy on breastfeeding, two groups of breastfeeding mother-child pairs were determined (see Table 1). After obtaining ethical approval from the Conjoint Medical Ethics Committee of the University of Calgary and the Foothills Hospital, and the Nursery Management Committee at the Foothills Hospital, mother-child pairs were recruited for the study.

Daily checks were made in the nursery at the hospital on the medical records of all births in the previous twenty-four hours to determine which mother-child pairs were eligible for the study. To define whether or not an infant was healthy, the Postnatal Complication Scoring Sheet (102) was used (Appendix A). This scoring system includes nine possible complications in the postnatal period, scored as present (=0) or absent (=1) plus whether or not the baby fed within 48 hours (no=0,yes=1). A score of eight or more indicated that the infant was healthy. This score was used as opposed to nine or more, which had been used previously (102), because one of the complications on the list was hyperbilirubinemia and as this was desired in half of the subjects the criterion

Table 1: Inclusion Criteria for Study Sample

Treatment Group	No-treatment Group
term (37-41 weeks gestation, by dates)	term (37-41 weeks gestation, by dates)
vaginal delivery	vaginal delivery
2.5 kg. or more birthweight	2.5 kg. or more birthweight
healthy	healthy
jaundice requiring treatment	no treatment for jaundice prescribed
primarily breastfeeding for the first 3 days of life (or until put onto treatment)	primarily breastfeeding for the first 3 days of life

for "health" was relaxed by one point.

The treatment for the treatment group was phototherapy. Even if the infants had been taken off the breast temporarily as part of the treatment, that mother-child pair was still included in the sample.

"Primarily breastfeeding" was defined earlier in the chapter on the issues in breastfeeding research, as being such when more than half of the infant's feeds were breastfeeds after the first twenty four hours. This was determined from the infants' charts, not from the mothers themselves at this point.

The final two criteria which had to be fulfilled before the mothers could be approached were that the mothers had to be married and living in or near to Calgary. Only married mothers were approached in order to avoid the additional complication of the effect the circumstances of an unmarried mother might have on the course of breastfeeding, such as an earlier required return to work or a difference in stress. The latter criterion was included to make it practical for the researcher to visit the mothers in their homes.

The desired sample size of each of the study groups was based on the potential differences that might be detected

between the two groups. Based on the proportion of mothers who started breastfeeding and who were still breastfeeding at six weeks (67%) (103) the size of each group would be thirty to fifty for a decrease in those breastfeeding of between twenty-five to thirty percentage points with α=0.10 and power of 80%. If the calculations were based on the proportion (36%) of mothers who experience 1 or more lactational crises (71), then the size of each group would again be thirty to fifty for an increase in the proportion of such women of between twenty-five to thirty percentage points with α=0.10 and power of 80%. Thus the sample size aimed for in each group was approximately forty (104).

Once the eligibility of a mother-child pair was established one of the nursing staff on duty in charge of caring for the mothers was asked for permission to approach the individual mother regarding the study. This was done in order to prevent intrusions on the mothers at an inappropriate time, such as when they were very upset. Once permission was gained, the mothers were approached; the nature of the study was explained to them and a consent form was signed by them if they were willing to participate (Appendix B). The mothers were approached on either day two or day three of the infants life so that the investigator interviewed the mothers at a similar stage in the infants' lives without disturbing the mother too soon after the baby was born but not too late so

that many mothers were missed, having already gone home. The mothers were also at similar stages of developing their relationship with their baby and establishing feeding routines. At this stage it was generally known which group the mother-child pair would belong to i.e. the treatment or no-treatment group. Any child that started off in the no-treatment group and was later put onto phototherapy, however, was excluded from the study in the final analysis. A letter was also sent to the mother's physician informing him/her about the study and the woman's participation in it (Appendix C).

Once the informed consent was obtained further data was collected from the mothers' and infants' medical records until all the required data was complete. Therefore, the following data was collected for each of the mother-child pairs in addition to the eligibility criteria: (1) for the mother the information obtained was the address, phone number, age, length of labour, type of anaesthesia/analgesia, any medical conditions during pregnancy and their treatment and the length of the stay in hospital and (2) for the infant the information obtained, where appropriate, was the sex, apgar scores, time of the first breastfeed, " rooming-in" situation, any bilirubin levels, cause of jaundice, the treatment regime for jaundice and length of hospital stay. The regime for measuring bilirubin levels was not altered by the researcher,

but they continued to be done on the orders of the physician in charge, according to the situation. Daily checks obtained the above information over approximately a two and a half month time period until the required sample sizes were obtained.

As well as collecting data from the medical records of the treatment and no-treatment groups, both groups were interviewed at three stages. The first interview took place in the hospital, either on the enrollment day or the day after, depending on the receptivity or availability of the mother to be interviewed. The second interview was at the mother's home approximately one week after the mother and baby had gone home from the hospital, during the time of possibly greatest adjustment. The third interview took place by phone when the baby was approximately six weeks old i.e. once family routines were more established. Six weeks was chosen as studies have found that many women stop breastfeeding after just one month (74). A final follow-up was also carried out, to determine just the duration of breastfeeding, when the baby was six months old. This took the form of a letter mailed out asking the mother to return a card, asking about the duration of breastfeeding, in a stamped addressed envelope to the researcher. When the card was not returned within 3 weeks, up to 2 telephone calls were made to the mother at different times of the day to request that the card be

returned.

Structured interviews of the mothers at these three stages were developed (Appendix D). They were tested for suitable wording, additional responses and length of time to complete the questionnaire, by enrolling five mothers with infants, who would not be in the study, to answer the questions and comment. The interviews were to determine: baseline socio-demographic information, such as education of the mother, parity, and socioeconomic index, which was measured using Blishen's index (105); previous experience with breastfeeding; perceived knowledge about neonatal jaundice and its treatment; motivation for breastfeeding; proposed duration of breastfeeding; feeding routine; medications taken by the mother; reasons for discontinuing breastfeeding; stress levels of the mothers; and the success of breastfeeding efforts.

The stress levels were assessed using an adapted version (Appendix E) of the Parenting Stress Index by R.R. Abidin (106). This measurement tool was devised originally for parents with children older than those in this study and, therefore, some of the questions were irrelevant. Those questions which were felt to be unsuitable for mothers of a 1 to 2 week old baby were, therefore, excluded from the stress index used in this study. The stress index was tested for reliability and validity. Reliability was ascertained by

determining the Guttman split-half coefficients and the Spearman-Brown coefficients for the index as a whole and for each of the two domains of the index, namely the child domain and the parent domain. Face validity was assessed by six individuals from the fields of clinical psychology, medicine and nursing. This was the only self-administered part of the interview process.

The criteria for success of breastfeeding were defined as:-

1) the duration of breastfeeding,

2) premature discontinuation of breastfeeding which was defined as cessation of nursing at least 2 weeks before the mother had planned,

3) a subjective rating by the mother of the breastfeeding experience she did have; this was obtained by summing the scores from the first 4 questions of the Newborn Questionnaire (see Appendix E) which concerned different aspects of the breastfeeding experience i.e. from the mother's, baby's and family's points of view,

4) and the number and type of problems the mother had with breastfeeding and the baby in general.

The analyses were done on the University's mainframe computer using the Statistical Package for the Social Sciences (SPSS). The first analyses completed were frequencies of the

various descriptive data for the sample as a whole and the frequencies of the data on the jaundice and treatment regimes for the treatment group. Then comparisons were made on the descriptive data between the treatment and no-treatment groups to see if there were any basic underlying differences between the two groups. For this, t-tests were performed on continuous data and chi-square analyses on categorical data. The success criteria were also compared between the two study groups in the same way, but with the addition of survival analysis being done to ascertain whether or not the treatment and no-treatment groups breastfed for a significantly different length of time. Multiple regression was then performed on the initial set of variables i.e. those collected during the mothers' stay in hospital, which might affect the duration of breastfeeding. The significance level was set at $p=0.05$. Therefore, for a similar sample size as that obtained ($n=36-40$), using the criterion of a difference of twenty-five to thirty percentage points in those who had experienced one or more lactational crises, the power was 60-80%. Similarly, using the criterion of a difference of twenty-five to thirty percentage points in those still breastfeeding at six weeks, the power was 60-80%.

CHAPTER 4

RESULTS

Over the two and a half month enrolment period a total of 91 mothers of newborns were asked to participate in the study. Eight (8.8%) mothers refused to participate. The numbers enrolled in the phototherapy group and no-treatment group were 37 and 46 respectively; however, from the no-treatment group 5 infants were put onto phototherapy after they were enrolled and 1 mother withdrew from the study at the second interview. Therefore, these 6 were excluded from the remaining analyses. This left the final numbers as 37 in the phototherapy group and 40 in the no-treatment group. For the final follow-up at six months, 6.5% (n=5) of the total sample did not return the card and could not be contacted; however, the data on these was still used as far as possible in the analyses.

DESCRIPTIVE DATA

The mean age of the total sample of women was 27.7 $\pm$ 4.1 years; as throughout this report, this signifies mean and standard deviation. The treatment group was slightly older (treatment group 28.6 $\pm$ 3.8 years; no-treatment group 26.9 $\pm$ 4.3 years), but it was not significant (t=1.85, 75 df,

p=0.07). This group of women was well-educated (see tables 2 and 3) and 68.8% (n=53) had been working outside the home before the pregnancy with their present baby (treatment group 73.0%, n=27; no-treatment group 65.0%, n=26); none of these variables were significantly different (X^2=4.94, 3 df, p=0.18 for years of school; X^2=0.78, 4 df, p=0.94 for further training; and X^2=0.57, 1 df, p=0.45 for working outside the home prior to pregnancy with study infant). For a description of their socio-economic status, as measured by the husbands occupation see figure 1; there was no significant difference between the socioeconomic status of the two groups (X^2=1.36, 3 df, p=0.71).

With regard to family size, approximately half of the sample (49.4%; n=38) were first-time mothers and this was similar for both groups (treatment group 45.9%, n=17; no-treatment group 52.5%, n=21; X^2=0.33, 1 df, p=0.57). Of those women who were not first time mothers, 69.2% (n=27) had just one other child, 23.1% (n=9) had two other children and 7.7% (n=3) had three other children. For the treatment group these figures were 70.0% (n=14), 20.0% (n=4) and 10.0% (n=2) respectively, and for the no-treatment group they were 68.4% (n=13), 26.3% (n=5) and 5.3% (n=1). The average number of other children in the family was 1.4 $\pm$ 0.6 and this was not significantly different between groups (treatment group 1.4 $\pm$ 0.7; no-treatment group 1.4 $\pm$ 0.6; t=0.15, 37 df, p=0.88).

Table 2: School Background of the Total Sample of Mothers

High School Education of the Mothers		
Years of School	# (% group) Treatment Group	# (% group) No-treatment Group
10	2 (5.4)	1 (2.5)
11	1 (2.7)	6 (15.0)
12	33 (89.2)	30 (75.0)
13	1 (2.7)	3 (7.5)

Table 3: Further Training after High School of the Total Sample of Mothers

Type of Training beyond High School	# (% group) Treatment Group	# (% group) No-treatment Group
None	10 (27.0)	12 (30.0)
Technical/Trade School	7 (18.9)	7 (17.5)
College	7 (18.9)	10 (25.0)
University	12 (32.4)	10 (25.0)
Other	1 (2.7)	1 (2.5)

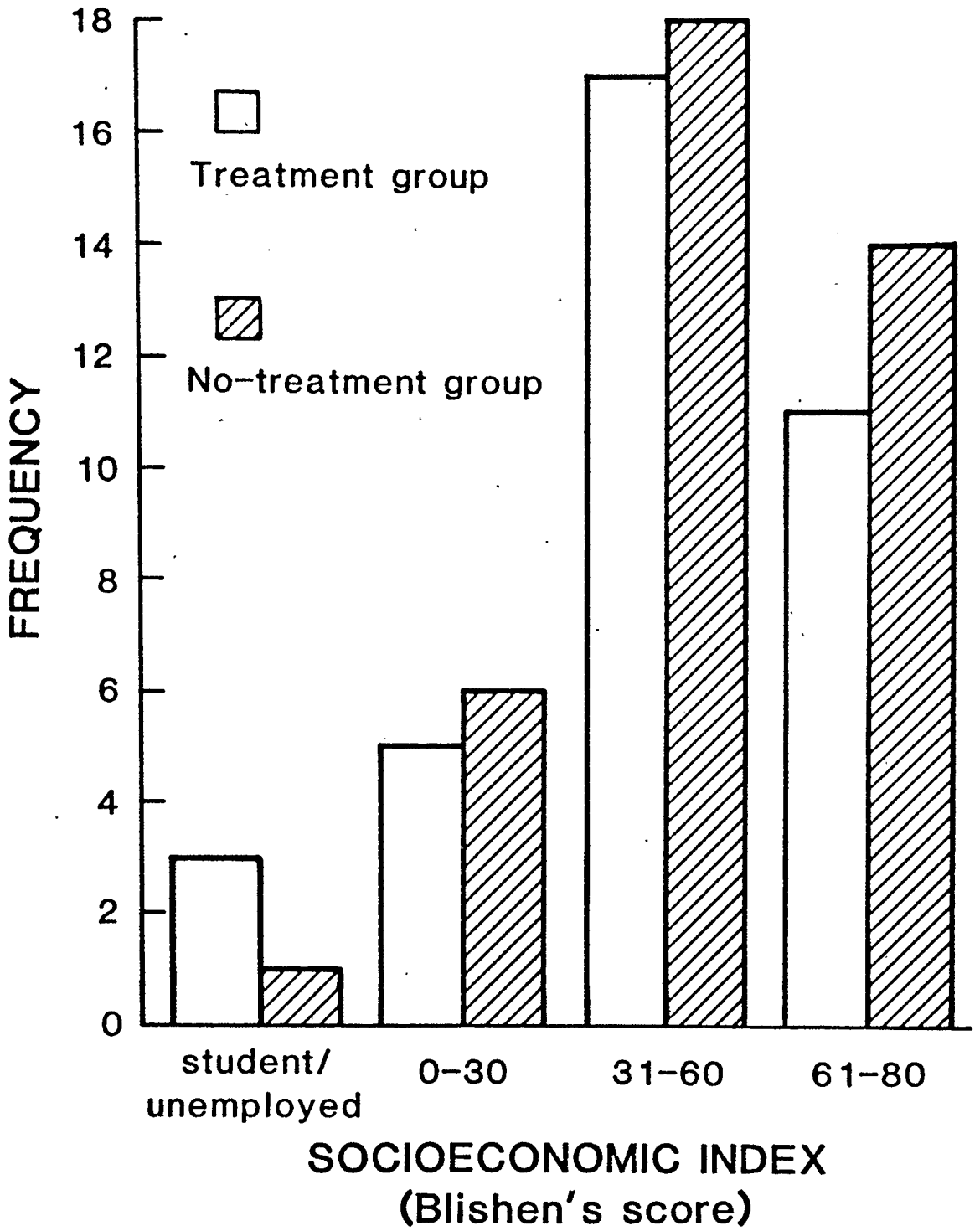

Fig 1. DISTRIBUTION OF SOCIOECONOMIC INDICES IN STUDY SAMPLE

The average age of the previous child was 2.6 ± 1.4 years and again this was not significantly different between the two groups (treatment group 2.5 ± 1.1; no-treatment group 2.7 ± 1.6; t=-0.66, 37 df, p>0.25).

Past breastfeeding experience varied slightly in the group as a whole, although not significantly differently between the treatment and no-treatment groups. Only one woman had not breastfed her previous child (who was also her only other child); of those who had two other children 88.9% (n=8) had breastfed both (treatment group 100.0%, n=4; no-treatment group 80.0%, n=4); and of those who had three other children, they had all breastfed only two of them. This meant that 49.4% (n=38) of the total sample had had previous experience with breastfeeding.

The average number of previous children breastfed, where applicable, was 1.3 ± 0.5, which was not significantly different between groups (treatment group 1.3 ± 0.6; no-treatment group 1.3 ± 0.5; t=-0.08, 36 df, p=0.94). The duration of the previous breastfeeding experience was 8.2 ± 4.9 months. The treatment group had breastfed for a slightly shorter time, but the difference was not significant (treatment group 7.3 ± 4.4 months; no-treatment group 9.1 ± 5.3 months; t=-1.10, 36 df, p=0.28). The previous breastfeeding experience was also rated by the mothers during

the initial interview on a three point scale of "good", "satisfactory" and "poor". 86.8% (n=33) of the mothers said that their previous breastfeeding experience was "good", 2.6% (n=1) said that it was "satisfactory" and 10.5% (n=4) said that it had been a "poor" experience. For the treatment group the respective figures are: 84.2% (n=16), 0% and 15.8% (n=3); and for the no-treatment group the figures are: 89.5% (n=17), 5.3% (n=1) and 5.3% (n=1). These ratings are not significantly different between the two groups (X^2=2.03, 2 df, p=0.36). Of those who had breastfed more than one child, the previous experience was stated as typical of the other child/children by 72.7% (n=8) of the mothers (treatment group 66.7%, n=4; no-treatment group 80.0%, n=4).

The data collected on the pregnancies of the study mothers showed that the vast majority (96.1%, n=73) had not had any medical problems during the pregnancy and this was similar for both groups (treatment group 94.4%, n=34; no-treatment group 97.5%, n=39; X^2=0.47, 1 df, p=0.49); pericarditis, yeast infection and keratomycosis were the only conditions stated. The mean length of labour was slightly less than ten hours (582.0 $\pm$ 452.4 minutes) although it ranged from 115 minutes to 2906 minutes. The mothers from both groups were in labour for similar lengths of time (treatment group 510.3 $\pm$ 355.7; no-treatment group 648.1 $\pm$ 522.2; t=-1.32, 73 df, p=0.19). During labour different types of

anaesthesia were administered (see table 4), and there was no difference between the groups in what was given (X^2=0.46, 4 df, p=0.98). Also 66.2% (n=51) of the women were reported as not receiving any analgesia (see table 5) and again there was no difference between the treatment and no-treatment groups (X^2=4.11, 3 df, p=0.25).

Information was collected concerning the feeding of the infants. 51.9% (n=40) of the mothers had nursed the infant in the caseroom (treatment group 54.1%, n=20; no-treatment group 50.0%, n=20; X^2=0.13, 1 df, p=0.72) and for the others the mean length of time after the birth at which the first breastfeed took place was approximately 5 hours (total sample 302.3 $\pm$ 197.6 minutes; treatment group 349.9 $\pm$ 230.3; no-treatment group 261.9 $\pm$ 159.9; t=1.37, 35 df, p=0.18). The treatment and no-treatment groups were similar with respect to the timing of the first breastfeeding contact between mother and child.

Mothers were asked about their reasons for breastfeeding the study infant. They were able to state more than one reason and the mean number of reasons was 2.3 $\pm$ 1.0. Both the treatment and no-treatment groups stated approximately the same number of reasons (treatment group 2.2 $\pm$ 1.0; no-treatment group 2.3 $\pm$ 1.0; t=-0.36, 75 df, p=0.72). The mothers were also asked for their major reason for the

Table 4: Use of Anaesthesia During Labour

Type of Anaesthesia Used	# (% group) Treatment Group	# (% group) No-treatment Group
None Stated	7 (19.4)	7 (17.9)
Local	16 (44.4)	16 (41.0)
Epidural	6 (16.7)	7 (17.9)
Pudendal	3 (8.3)	5 (12.8)
More than one	4 (11.1)	4 (10.3)

Table 5: Use of Analgesia During Labour

Type of Analgesia Used	# (% group) Treatment Group	# (% group) No-treatment Group
None Stated	23 (62.2)	28 (70.0)
Demerol	9 (24.3)	8 (20.0)
Demerol + Other	2 (5.4)	4 (10.0)
Other	3 (8.1)	0 (0.0)

decision to breastfeed their present infant; for the distribution of the major reasons cited see table 6. This distribution of the reasons for breastfeeding was not significantly different between the phototherapy and no-treatment groups (X^2=7.51, 6 df, p=0.28). The main influence on this decision to breastfeed was the mothers own feelings (see table 7 for all influences); again this was not significantly different between the groups (X^2=5.15, 8 df, p=0.74).

The mean length of time the mothers planned to breastfeed for was 6.1 $\pm$ 3.2 months and this was not significantly different between the two groups (treatment group 6.4 $\pm$ 3.2 months; no-treatment group 5.9 $\pm$ 3.3 months; t=0.56, 72 df, p=0.58); only 3.9% (n=3) of the women did not have any idea how long they would breastfeed for (treatment group 5.4%, n=2; no-treatment group 2.5%, n=1). All of the mothers felt that the hospital staff were supportive of their breastfeeding efforts.

Overall, in hospital, 61.0% (n=47) fed on demand as opposed to by a schedule, the mean number of feeds per day was 7.8 $\pm$ 1.7 which is approximately every three hours and 59.7% (n=46) were supplementing the breastfeeds with another type of feed. There were some differences between the treatment and no-treatment groups in these feeding routines in hospital.

Table 6: Mothers' Major Reasons for the Decision to Breastfeed the Study Infant

Reason	# (% group) Treatment Group	# (% group) No-treatment Group
Best for Baby	20 (54.1)	20 (50.0)
Bonding	7 (18.9)	7 (17.5)
"Natural"	4 (10.8)	1 (2.5)
Convenient	0 (0.0)	4 (10.0)
Economics	1 (2.7)	1 (2.5)
More than one	1 (2.7)	0 (0.0)
Other	4 (10.8)	7 (17.5)

Table 7: Main Influence on the Mothers Decision to Breastfeed the Study Infant

Influence	# (% group) Treatment Group	# (% group) No-treatment Group
Own Feelings	19 (51.4)	20 (50.0)
Other Family Member	5 (13.5)	4 (10.0)
Prenatal Classes	3 (8.1)	5 (12.5)
Reading Books	5 (13.5)	2 (5.0)
Friend	3 (8.1)	3 (7.5)
Husband	1 (2.7)	1 (2.5)
Doctor	0 (0.0)	2 (5.0)
Previous Experience	0 (0.0)	1 (2.5)
Other	1 (2.7)	2 (5.0)

The phototherapy group were fed more by schedule than demand: 62.2% (n=23) by schedule and 37.8% (n=14) on demand compared with the no-treatment group who fed 17.5% (n=7) by schedule and 82.5% (n=33) on demand (X^2=16.12, 1 df, p<0.01). The treatment group also had approximately one less feed per day than the no-treatment group (7.4 $\pm$ 1.3 compared with 8.2 $\pm$ 1.9 respectively; t=-2.07, 75 df, p=0.04). The percentages of each group who were supplementing the breastfeeds were not significantly different, however (treatment group 62.2%, n=23; no-treatment group 57.5%, n=23; X^2=0.17, 1 df, p=0.68). Of this group who were supplementing, the types of supplements were as follows: 54.3% (n=25) glucose water or water, 37.0% (n=17) formula and 8.7% (n=4) formula, glucose water or water. For the treatment group the numbers were 69.6% (n=16), 21.7% (n=5) and 8.7% (n=2) respectively; and for the no-treatment group 39.1% (n=9), 52.2% (n=12) and 8.7% (n=2). The difference in the type of supplements was not significant (X^2=4.84, 2 df, p=0.09). For a description of the timing of the supplements, see table 8, where the difference between the groups is significant (X^2=11.60, 5 df, p=0.04). The phototherapy group used supplements between breastfeeds more compared with occasional use and vice versa for the no-treatment group.

With respect to the infants in the study sample, the total sample was divided almost equally between boys and

Table 8: Timing of Feeding Supplements Given to Infants in Hospital

	# (% group) Treatment Group	# (% group) No-treatment Group
Less than once a day	1 (4.3)	6 (26.1)
Once a day	3 (13.0)	4 (17.4)
With Breastfeeds	4 (17.4)	5 (21.7)
Between Breastfeeds	8 (34.8)	1 (4.3)
Other	5 (21.7)	7 (30.4)
Unknown	2 (8.7)	0 (0.0)

girls: 51.9% (n=40) boys and 48.1% (n=37) girls. The treatment group had more boys compared with the no-treatment group, but this was not significant (treatment group 62.2%, n=23 male and 37.8%, n=14 female; no-treatment group 42.5%, n=17 male and 57.5%, n=23 female; X^2=2.98, 1 df, p=0.08). Their mean gestational age by dates was 39.5 $\pm$ 1.0 weeks (treatment group 39.3 $\pm$ 1.1 weeks; no-treatment group 39.7 $\pm$ 0.9 weeks; t=-1.88, 75 df, p=0.07) and their mean birthweight was 3337.4 $\pm$ 392.0 grams (treatment group 3300.5 $\pm$ 370.0 grams; no-treatment group 3371.5 $\pm$ 413.1 grams; t=-0.79, 75 df, p=0.43). Neither of these variables was significantly different between the two groups. The mean apgar scores at one and five minutes were 7.4 $\pm$ 1.4 and 8.8 $\pm$ 0.5 for the total sample, 7.4 $\pm$ 1.6 and 8.7 $\pm$ 0.5 for the treatment group, and 7.5 $\pm$ 1.2 and 8.9 $\pm$ 0.4 for the no-treatment group (X^2=2.90, 6 df, p=0.82 for 1 minute; X^2=4.62, 3 df, p=0.20 for 5 minutes). None of the infants had apgar scores less than 2 at 1 minute or less than 5 at 5 minutes, which are the critical values indicating the overall status of the infant, and both groups were similar with respect to the apgar scores.

Other data collected showed that 72.7% (n=56) of the mothers were not on any medication in hospital (treatment group 81.1%, n=30; no-treatment group 65.0%, n=26; X^2=2.51, 1 df, p=0.11), and of those still breastfeeding, 94.4% (n=68) were not on any medication at the second interview (treatment

group 94.1%, n=32; no-treatment group 94.7%, n=36; X^2=0.01, 1 df, p=0.91) and 98.5% (n=67) were not on any at the six week interview (treatment group 96.9%, n=31; no-treatment group 100.0%, n=36; X^2=1.14, 1 df, p=0.29). At none of these interview times was there a significant difference between the two groups with regard to medications being taken. For a list of medications that were used see table 9.

The mothers were asked to rate, where applicable, the consistency of information they had received from all sources on the following matters: breastfeeding, neonatal jaundice and the treatment for neonatal jaundice. The ratings were: very consistent, consistent and inconsistent. The consistency of information on breastfeeding from all sources was similar for the treatment and no-treatment groups; it had been either consistent or very consistent for 84.4% (n=65) of the women (treatment group 75.7%, n=28; no-treatment group 92.5%, n=37; X^2=2.52, 1 df, p=0.11 when what was compared was very consistent and consistent versus inconsistent and no information). For those women whose babies were jaundiced, whether or not they were under phototherapy, the information on jaundice had been consistent or very consistent for 60.7% (n=34) of the women and the information on the treatment for jaundice had been consistent or very consistent for 63.6% (n=35) of the women.

Table 9: Medications Used by Mothers During the Study Period

Type of Medication	Medication Used
Multi-vitamins/Iron	Prenbule, Filibon Orifer, Materna Palafer, Trinsicon
Laxatives	Docusate Sodium Metamucil
Analgesics	Tylenol, Demerol 292's
Antibiotics	Cephalaxin
Skin Cream	Celestoderm, Velvelan
Bronchodilators (for asthma)	Ventolin
Cardioactive	Lanoxin
Ovulatory Agent (for infertility)	Clomid

The length of hospital stay for the total sample of mothers and their infants was recorded. All infants went home with their mothers and just one infant returned to the hospital; this was for one day of phototherapy. The average length of stay was 4.4 ± 1.0 days, but the treatment group stayed in hospital significantly longer: 4.8 ± 1.2 compared with 3.9 ± 0.7 days ($t=4.13$, 75 df, $p<0.01$).

The final item of descriptive information for the total sample was the stress score measured at the second interview. The stress of the mothers was measured so that if any differences had been found in the success of breastfeeding and in the stress scores the latter may have assisted in explaining some of the differences in the success criteria. The overall stress score was 121.1 ± 18.2, for the treatment group it was 118.8 ± 16.4 and for the no-treatment group 123.2 ± 19.6; this was not significantly different ($t=-1.06$, 74 df, $p=0.29$).

TREATMENT GROUP DATA

The cause of the jaundice for the treatment group was physiological for 75.7% (n=28) and blood group incompatibility for 24.3% (n=9). Most of the mothers in this group (62.2%, n=23) perceived their infant's jaundice as not being serious,

whilst 24.3% (n=9) thought it was slightly serious and 13.5% (n=5) considered it moderately serious.

The mean bilirubin level at which phototherapy was started was 193.6 ± 31.0 umol/l and the mean level at which it was discontinued was 177.1 ± 26.8 umol/l. The mean maximum bilirubin level reached during phototherapy was 208.0 ± 30.0 umol/l and this occurred on approximately day three of the baby's life (mean 2.87 ± 0.82), which was also approximately the second day of phototherapy (mean 1.73 ± 0.93). Only 24.3% (n=9) of the treatment group had a bilirubin level taken the day after phototherapy was discontinued; the mean level was 192.78 ± 38.35 umol/l.

The infants were under the phototherapy lights for a mean of 2.22 ± 1.11 days. Phototherapy was generally started about day two of the infant's life (mean 2.14 ± 0.86) and stopped, therefore, about day four (mean 4.35 ± 1.01). Most (81.1%, n=30) of the infants in the treatment group were under regular lights in the nursery, but 13.5% (n=5) were under regular lights in the mother's room. Regular lights give an intensity of light of 3.5-4.5 uwatts/cm^2/nm. There were just 2 infants who were under both regular and high intensity lights (>4.5 uwatts/cm^2/nm); one was always in the nursery and the other was sometimes in the nursery and sometimes in the mother's room.

As part of the treatment for the jaundice breastfeeding was temporarily discontinued for 3 (8.1%) of the infants in the treatment group. Two of these were taken off for only one day and the other for two days. Two of the mothers expressed their milk for this time, but one did not. The number in this group was too small to analyse any effect this practice may have had on the success of further breastfeeding efforts.

Of those in the treatment group who had other children besides the study infant, 55.0% (n=11) of them had at least one previous child who had had jaundice. When it came to the mothers perceived knowledge on jaundice and its treatment, there was some variation (see tables 10 and 11). The mothers had been asked how consistent the information they had received from all sources had been on jaundice and on its treatment; generally the consistency of information had been quite good (see table 12).

SUCCESS OF BREASTFEEDING

To determine any differences in the success of breastfeeding between the two study groups the criteria set out in the methods section had to be compared individually before an overall impression could be gained.

Table 10: How Informed Mothers in the Treatment Group Felt on the Nature of Jaundice

	# (%) Treatment group
Very Well Informed	3 (8.1)
Well Informed	16 (43.2)
Slightly Informed	15 (40.5)
Uninformed	2 (5.4)
Unconcerned	1 (2.7)

Table 11: Perceived Knowledge of Treatment for Jaundice of the Mothers in the Treatment Group

	# (%) Treatment Group
Great Deal	1 (2.7)
Quite a Lot	17 (45.9)
Not Very Much	18 (48.6)
Nothing	1 (2.7)

Table 12: Consistency of Information Given to the Mothers in the Treatment Group From All Sources on Jaundice and its Treatment

	Consistency of Information:-	
	On Jaundice #(%) Treatment Group	On Treatment #(%) Treatment Group
Very Consistent	7 (18.9)	6 (16.2)
Consistent	17 (45.9)	20 (54.1)
Inconsistent	2 (5.4)	1 (2.7)
One Source of Information	10 (27.0)	9 (24.3)
No Information	1 (2.7)	1 (2.7)

1) Duration of Breastfeeding

For a description of the numbers of women who had stopped breastfeeding by the various interview times see table 13 and 14. Data had been collected on which week these mothers had stopped breastfeeding and this was used in the survival analysis, the results of which showed no difference between the treatment and no-treatment groups with respect to duration of breastfeeding (see figure 2; Lee-Desu statistic=0.007, 1 df, p=0.93).

2) Premature Discontinuation of Breastfeeding

Of the total sample of women, 3.9% (n=3) did not know how long they planned to breastfeed for, on 6.5% (n=5) there was no six month follow-up data and 20.8% (n=16) had stated that they would breastfeed for a period greater than six months and they were still breastfeeding at six months. Therefore, these subjects (n=24; 31.2% of the total sample) could not be used in the analysis of this criterion. The data on the rest of the subjects is presented in table 15 and no significant difference was found between the treatment and no-treatment groups in the proportion of women who had discontinued breastfeeding prematurely (X^2=1.69, 1 df, p>0.10).

Table 13: Pattern of Discontinuation of Breastfeeding

	Total # Mothers Stopped Breastfeeding (% each group)	
	Treatment Group	No-treatment Group
by 2nd interview	3 (8.1)	2 (5.0)
by 6 weeks	5 (13.5)	4 (10.0)
by 6 months	18 (48.6)	20 (50.0)

Table 14: Pattern for Those Still Breastfeeding

	Total # Mothers Still Breastfeeding (% each group)	
	Treatment Group	No-treatment Group
at 2nd interview	34 (91.9)	38 (95.0)
at 6 weeks	32 (86.5)	36 (90.0)
at 6 months	19 (51.4)	20 (50.0)

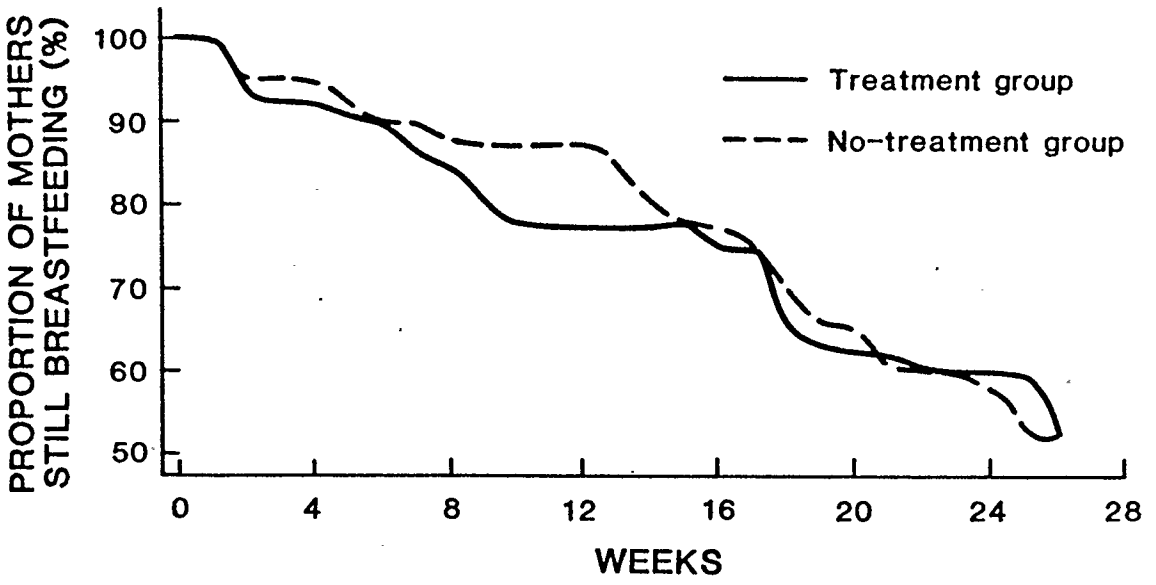

Fig 2. DURATION OF BREASTFEEDING FOR STUDY SAMPLE

Table 15: Mothers who Discontinued Breastfeeding Prematurely

	# Mothers (% each group)	
	Premature Discontinuation	Non-premature Discontinuation
Treatment Group	11 (50.0)	11 (50.0)
No-treatment Group	10 (32.3%)	21 (67.7%)
Total	21 (39.6%)	32 (60.4%)

3)Problems During Breastfeeding

This criterion was divided into three categories: lactational crises, breast problems and any other types of problems. The results are presented here separately for those who were still breastfeeding at interview two, those who were still breastfeeding at interview three and the early discontinuers i.e. those who had stopped breastfeeding during the initial six weeks. Some of the numbers in these categories were small, which hampers analyses.

a)lactational crises: with respect to the percentages of those still breastfeeding who had experienced 1 or more lactational crises by the second interview, there was no significant difference between the two study groups; 15.3% (n=11) of the total sample were in this category (treatment group 17.6%, n=6; no-treatment group 13.2%, n=5; X^2=0.28, 1 df, p=0.60). However, of those still breastfeeding at interview three there was a significant difference (X^2=6.96, 1 df, p=0.01) between groups in those who had experienced 1 or more lactational crises between interviews two and three. 53.1% (n=17) of the treatment group and 22.2% (n=8) of the no-treatment group had experienced at least one lactational crisis between interviews two and three and were still breastfeeding at interview three. For a breakdown of the time trend of 1 or more lactational crises see table 16 where the denominator for the percentages

Table 16: Time Trend of the Occurrence of One or More Lactational Crises

	# Mothers who experienced one or more lactational crises (% each group)	
	between interview 1 and 2	between interview 2 and 3
Treatment Group	7 (18.9)	18 (52.9)
No-treatment Group	6 (15.0)	10 (26.3)

is the number of subjects breastfeeding in that study group for some or all of that time period i.e. for the treatment group n=37 between interviews one and two and n=34 between interviews two and three, and for the no-treatment group the respective numbers are 40 and 38. Four of the treatment group and two of the no-treatment group had experienced lactational crises during both periods.

The duration of the lactational crises (i.e. the number of feeds it lasted for), and the frequency of these crises (i.e. the number of crises which occurred in the time period under question), at both interviews was not different between the two groups. For those who reported one or more lactational crises at interview two, the distribution of the duration of these crises was: for one feed, 33.3% (n=2) of the treatment group and 40.0% (n=2) of the no-treatment group were in this category; for two or three feeds, 50.0% (n=3) of the treatment group and 40.0% (n=2) of the no-treatment group; and for four or more feeds, 16.7% (n=1) of the treatment group and 20.0% (n=1) of the no-treatment group (X^2=0.11, 2 df, p=0.95). The mean number of lactational crises was 3.5 $\pm$ 2.9 and 9.0 $\pm$ 6.4 for the treatment and no-treatment groups respectively (t=-1.90, 9 df, p=0.09).

The distribution of the duration of lactational crises reported at interview three was as follows (X^2=0.64, 2 df,

p=0.72): for one feed there were 58.8% (n=10) of the treatment group and 75.0% (n=6) of the no-treatment group in this category; for two or three feeds, 23.5% (n=4) of the treatment group and 12.5% (n=1) of the no-treatment group; and for four or more feeds, 17.6% (n=3) of the treatment group and 12.5% (n=1) of the no-treatment group. To obtain these percentages the denominators used were the numbers in each group who had experienced one or more lactational crises between interviews two and three and were still breastfeeding at interview three i.e. n=17 for the treatment group and n=8 for the no-treatment group. The mean number of lactational crises was 13.5 $\pm$ 12.5 and 11.8 $\pm$ 15.1 for the treatment and no-treatment groups respectively (t=0.31, 23 df, p=0.76).

With regard to the early discontinuers' experience, two of the treatment group and three of the no-treatment group had experienced one or more lactational crises. The duration of these crises was as follows: for one feed, one of the treatment group and two of the no-treatment group; and for four or more feeds, one of the treatment group and one of the no-treatment group. The frequency of these crises for the treatment group was once for one of the subjects and four times for the other mother. For the no-treatment group, the frequency of lactational crises was twice for one subject, seven times for another subject and twenty-four times for the final subject.

b)breast problems: there was no difference between the treatment and no-treatment groups at interview two (X^2=0.68, 4 df, p=0.95) or three (X^2=4.85, 6 df, p=0.56) for those still breastfeeding at those times, with respect to breast problems (see table 17 and 18 for distribution of breast problems). 55.6% (n=5) of the early discontinuers had not had any breast problems and the remainder (44.4%, n=4) were equally divided between having had tender nipples, cracked nipples, mastitis and more than one problem.

c)other problems: the other types of problems encountered fell into the following categories: the baby had a rash, the baby had a cold, the baby had another illness and any other baby related problem. The overall presence or absence of any of these problems was not significantly different between the study groups for those still breastfeeding at interview two and interview three. Of those still breastfeeding at the interview times, 17.6% (n=6) of the treatment group and 21.1% (n=8) of the no-treatment group had experienced one of these other problems at interview two (X^2=0.13, 1 df, p=0.72). The figures for interview three are 25.0% (n=8) and 42.9% (n=15) for the treatment and no-treatment groups respectively (X^2=2.36, 1 df, p=0.12). If there were any such problems, then the types of problems were not different between the

Table 17: Breast Problems Encountered During Breastfeeding by those Mothers Still Breastfeeding at Interview 2

	# (% each group) Mothers who experienced the problem between interview 1 and 2	
	Treatment Group	No-treatment Group
none	26 (76.5)	29 (76.3)
engorged breasts	2 (5.9)	3 (7.9)
sore breasts	2 (5.9)	3 (7.9)
tender nipples	2 (5.9)	2 (5.3)
cracked nipples	2 (5.9)	1 (2.6)

Table 18: Breast Problems Encountered During Breastfeeding by those Mothers Still Breastfeeding at Interview 3

	# (% each group) Mothers who experienced the problem between interview 2 and 3	
	Treatment Group	No-treatment Group
none	26 (81.3)	34 (94.4)
sore breasts	1 (3.1)	0 (0.0)
tender nipples	1 (3.1)	0 (0.0)
cracked nipples	1 (3.1)	0 (0.0)
mastitis	1 (3.1)	1 (2.8)
more than one	1 (3.1)	0 (0.0)
other	1 (3.1)	1 (2.8)

treatment and no-treatment groups at interview two (X^2=4.93, 2 df, p=0.09) and at interview three (X^2=2.92, 4 df, p=0.57). See table 19 and 20 for the distribution of the types of problems.

There was only one early discontinuer who had encountered one of these "other" problems; she was in the no-treatment group and had had a baby related problem which was not an illness.

As an addition to this criterion of "problems during breastfeeding", information was gained on advice sought for any of these problems. No difference was found, in whether or not advice was sought, between the groups for those women still breastfeeding at interview two; 40.0% (n=6) of the treatment group who were in this category and 47.1% (n=8) of the no-treatment group had sought advice (X^2=0.16, 1 df, p=0.69). At interview three, however, for those women who had had problems and who were breastfeeding at interview three, there was a significant difference (X^2=4.53, 1 df, p=0.03) with 19.0% (n=4) of the treatment group and 50.0% (n=11) of the no-treatment group seeking advice.

If advice was sought for any problem at interview two for those still breastfeeding, there was no significant difference

Table 19: Problems With the Baby (other than lactational crises and breast problems) for those Mothers Still Breastfeeding at Interview 2

	# (% each group) Mothers who experienced the problem between interview 1 and 2	
	Treatment Group	No-treatment Group
rash	0 (0.0)	4 (50.0)
other illness	1 (16.7)	0 (0.0)
non-illness	5 (83.3)	4 (50.0)

Table 20: Problems With the Baby (other than lactational crises and breast problems) for those Mothers Still Breastfeeding at Interview 3

	# (% each group) Mothers who experienced the problem between interview 2 and 3	
	Treatment Group	No-treatment Group
rash	0 (0.0)	1 (6.7)
cold	1 (12.5)	5 (33.3)
other illness	3 (37.5)	3 (20.0)
non-illness	4 (50.0)	5 (33.3)
other	0 (0.0)	1 (6.7)

in the type of problem it was sought for (X^2=3.79, 3 df, p=0.28) nor in whether it was alleviated or not (X^2=0.07, 2 df, p=0.97). 42.9% (n=6) of these mothers sought the advice for breast problems (treatment group 50.0%, n=3; no-treatment group 37.5%, n=3); 21.4% (n=3) for lactational crises (treatment group 0%; no-treatment group 37.5%, n=3);, 28.6% (n=4) for one of the "other" problems (treatment group 33.3%, n=2; no-treatment group 25.0%, n=2); and 7.1% (n=1) for more than one problem (treatment group 16.7%, n=1; no-treatment group 0%). Also 53.8% (n=7) said the problem had been alleviated (treatment group 50.0%, n=3; no-treatment group 57.1%, n=4), 15.4% (n=2) said it had been alleviated slightly (treatment group 16.7%, n=1; no-treatment group 14.3%, n=1) and 30.8% (n=4) said it had not been alleviated (treatment group 33.3%, n=2; no-treatment group 28.6%, n=2).

However, for those still breastfeeding at interview three who sought advice for any problem, there was a significant difference (X^2=8.18, 3 df, p=0.04) in the type of problem the advice was sought for (see table 21). The no-treatment group had mostly sought advice for the "other" problems whereas the treatment group had not. Whether the problem was alleviated or not, though, at interview three was not significntly different between the two groups (X^2=1.26, 2 df, p=0.53); 71.4% (n=10) said it had been alleviated (treatment group 75.0%, n=3; no-treatment group 70.0%, n=7), 14.3% (n=2) said

Table 21: Problems Advice Sought for at Interview 3

	Treatment Group (#)	No-treatment Group (#)
Lactational Crises	2	1
Breast Problem	0	1
"Other" Problem	0	8
More than one	2	1

it had been alleviated slightly (treatment group 25.0%, n=1; no-treatment group 10.0%, n=1) and 14.3% (n=2) said it had not been alleviated (treatment group 0%; no-treatment group 20.0%, n=2).

4) Subjective Rating of Satisfaction with Breastfeeding Experience

For those women breastfeeding at interview two and at interview three, there was no statistically significant difference between the two study groups in their rating of their breastfeeding experience (at interview 2: t=-0.16, 69 df, p=0.87; at interview 3: t=1.10, 66 df, p=0.28). The mean satisfaction scores were 5.1 $\pm$ 1.7 and 4.8 $\pm$ 1.2 for the second and third interviews respectively. For the treatment group the scores were 5.1 $\pm$ 1.6 and 5.0 $\pm$ 1.3, and for the no-treament group they were 5.2 $\pm$ 1.9 and 4.6 $\pm$ 1.2. The mean satisfaction score for the early discontinuers was 7.9 $\pm$ 4.2.

FACTORS INFLUENCING DURATION OF BREASTFEEDING

The results of the stepwise regression analysis showed that the most important variable for explaining the variation in the duration of breastfeeding was whether the mother fed the infant on a schedule or by demand in the hospital at the

time of the initial interview. Those who fed on a schedule breastfed for 16.11 ± 9.62 weeks whilst those who fed on demand fed for 21.67 ± 6.93 weeks. The only other variable that was important in explaining the duration of breastfeeding was the age of the mother: the older the mother the longer she breastfed her baby. These two variables together explain 21.3% of the variation in the dependent variable, duration of breastfeeding. The F value for this equation was 9.2 and $p<0.01$.

RELIABILITY AND VALIDITY OF THE STRESS INDEX

The stress index as a whole was found to be reliable with a Guttman split-half coefficient of 0.85 and a Spearman-Brown coefficient of 0.85 also. When the child domain of the index was considered the two coefficients were 0.66 and 0.68 respectively. For the parent domain they were both 0.84.

The stress index was considered overall to be a valid tool for measuring the stress of a mother with a young infant. The only concerns expressed were over some questions which were thought to possibly not measure stress. However, these questions were still included as they had been tested for validity by the author of the original stress index and they were not influenced by the age of the child.

CHAPTER 5

DISCUSSION

Descriptive Information

The group of women involved in this study was generally a healthy group who had not had any major problems during their pregnancies with the study infants and who delivered their healthy babies vaginally, also with no major problems. Most (72.7%,n=56) of the mothers were not on any medications even in the hospital and once they were at home this percentage increased greatly. Those medications that were taken are not considered to interfere with breastfeeding (107).

The educational experience of the mothers was similar to that found for Calgary as a whole in the 1981 census (108). Therefore, in this respect the study population was representative of the Calgary population. The census showed that in Calgary less than 10% of the population had less than a grade nine education. Slightly over half of the population had training beyond high school, and the majority of these had gone to college or university. The education of the study population showed that approximately 70% of the subjects had further training beyond high school. In fact, approximately half of the subjects had gone to college or university. This

indicates a well-educated population.

The primary reason stated by the mothers for deciding to breastfeed the study infant was that it was best for the baby. This is similar to what has been reported in the literature (69,72,73,75,76,82). The main influence on this decision was the mother herself, which is also similar to some of the literature (69,75). The reasons given for discontinuing breastfeeding by the mothers who stopped breastfeeding by six weeks could be divided into lactational (insufficient milk and breast problems) and external (doctor's advice and "other") reasons. However, the second category may include some reasons which were originally lactational. Insufficient milk was an important reason for terminating breastfeeding, which concurs with the literature (69,76).

It was encouraging to note that approximately half of the mothers had nursed their infant in the caseroom. Early contact between mother and child has been associated with an increased duration of breastfeeding (66). Also the majority of mothers started breastfeeding their infants on demand which is important to establish lactation (66) and to ensure that the baby is receiving enough milk. Demand feeding also frequently leads to an increased number of breastfeeds compared with scheduled feeding, and a higher breastfeeding frequency has been associated with lower serum bilirubin

levels (5). Therefore, demand feeding overall is felt to be beneficial to the infant.

Despite the above mentioned positive results, it was discouraging to find that most of the infants were being supplemented in the hospital. This is a practice which may make it more difficult for a successful breastfeeding routine to be established because the infant is having to learn two separate sucking reflexes as the nipple of a bottle is different to the mothers nipple (109,110). Also supplementation may interfere with breastfeeding, as thirst is the infant's drive to suckle, and if the infant is not as thirsty the demand on the breast will be lower, which may interfere with lactation (101,109). The majority of the supplements were either glucose water or water. This may indicate that the purpose of the supplementation was usually to prevent thirst or dehydration rather than hunger, particularly in the case of the infants under phototherapy. However, formula was still given fairly frequently and so the reason could sometimes have been to prevent hunger or maybe due to hospital routine. Nicoll (101) found that hunger was the reason for supplementation in 40.0% (n=34) of the subjects and jaundice in 15.3% (n=13); supplementation had also been given prior to lactation in 40.0% (n=34) and when lactation failed in 4.7% (n=4). A further discussion on the use of supplements as it pertains to the phototherapy regime is given

under the section "Treatment Regime".

Treatment Regime

Phototherapy for neonatal jaundice is a widely used treatment. However, there are no firm guidelines as to when an infant should be put under the phototherapy lights. In this study, treatment was commenced when the bilirubin was 193.6 ± 31.0 umol/l, which is approximately that suggested by several authorities (7,9,36,43) for healthy, term infants with non-haemolytic hyperbilirubinemia. For almost 25% of the sample, though, the jaundice was due to blood group incompatability. If the suggestion of Lewis et al (39) had been fully adopted in this hospital i.e. if treatment had been withheld until a bilirubin level of 320 umol/l, then none of the infants would have been started on phototherapy as soon as they were and some of them probably would not have been treated by phototherapy lights at all. Treatment was discontinued at a bilirubin level of 177.1 ± 26.8 umol/l, which is lower than the level at which phototherapy was started, and which, therefore, was according to recommendations (9,36).

A rebound effect was seen in those infants who had a bilirubin level estimated after phototherapy had been discontinued. The size of this effect brought the bilirubin

level up to approximately what it had been at the start of treatment. However, the infants were also slightly older at this stage and so the bilirubin level was not considered as critical even though it was similar to that at the start of treatment. No further bilirubin estimations were done and so it could not be determined how quickly the bilirubin level decreased after this initial rebound.

The infants were kept under the phototherapy lights for a short time only (2.2 $\pm$ 1.1 days). This fairly short period of time may indicate the effectiveness of the treatment or that the bilirubin level would naturally have not risen much higher than the noted peak bilirubin level and would have decreased fairly rapidly anyway. Phototherapy occurred around the time when mothers frequently feel low emotionally. This, therefore, may have added a stress which possibly could have waited until later or may have been unnecessary altogether.

Not many of the infants were treated with a portable phototherapy unit set up in the mothers room and so the potentially beneficial effect of having the child in the room close to the mother could not be determined. It may be speculated that mothers with infants treated this way would be more successful in breastfeeding than if the infant were treated by phototherapy in the nursery. The mother would not

have to make so many trips to and from the nursery, and would be able to spend more time with her infant. This would enhance the mother-child contact. However, some mothers might find the bright lights disturbing and when a room is shared with another mother it may not be possible to use the portable lights.

It was also noted that breastfeeding was discontinued for three of the treatment group infants. This practice is due to the general idea that bilirubin levels decrease more quickly when breastfeeding is discontinued, because of the association between breastfeeding and neonatal jaundice (10,33-35). However, the association is limited and debatable and, more importantly, temporary cessation of breastfeeding may have deleterious consequences for the resumed breastfeeding efforts (13,61,62,111). There were, obviously, too few in this category to study any effect on the breastfeeding experience.

The mothers in the treatment group were questioned concerning their perceived knowledge of jaundice and its treatment so that if phototherapy did disrupt breastfeeding it could be determined whether or not those who knew more or less had more successful breastfeeding experiences. Increased knowledge of jaundice and phototherapy may lead to more successful breastfeeding, because those who only know a small

amount may worry more as they do not realise that jaundice is not generally a serious illness. However, the opposite effect could possibly occur. 51.3 % (n=19) of the group felt at least well informed about jaundice. The supposition is that if they are well informed in the hospital they have received accurate information and so will not be worried unduly. Therefore, approximately half of the mothers were in this position, but it is of concern to note that 45.9% (n=17) of the mothers felt only slightly informed or uninformed about jaundice. Whether this is due to a lack of teaching on the health professionals' part or to a lack of understanding on the mothers' part, it is important for the mother to feel comfortable with her level of knowledge. Otherwise, if a mother does not feel knowledgeable enough about a matter concerning her baby, she may worry unnecessarily. This is obviously a situation to avoid whenever possible.

A similar pattern to that just described occurred when the mothers were asked about their perceived knowledge of the treatment for neonatal jaundice. 48.6% (n=18) of the mothers felt that they knew quite a lot or a great deal about the treatment and the rest said that they knew very little or nothing. Again this latter point is of concern for the reasons previously discussed.

Despite this apparent lack of information or lack of

understanding of the information, the majority of the mothers said that the information they had received on jaundice or its treatment had been at least consistent. Some women had only received information from one source and so obviously could not comment on consistency. Only a few women felt that the information had been inconsistent or had received no information. Therefore, the majority of the women were at least not further stressed by a confusing mixture of information nor, in fact, by believing their infants jaundice to be a serious matter, as most of them perceived their infants jaundice as not being serious. Slightly over half of the treatment group with other children had a previous child who had had jaundice. Therefore, they probably did not feel as concerned about their present infant having been in the situation before and not having seen any adverse consequences for their other child.

Some differences in the background data were noted between the groups which were probably due to the jaundice and phototherapy regime. First of all, the phototherapy group were fed more on a schedule. The babies under phototherapy were generally sleepy and were not with their mothers; therefore, they did not cry to be fed as the infants not under phototherapy did and so their mothers tended to feed them more on a schedule. The phototherapy group also tended to use supplements between breastfeeds and the no-treatment group

used them more occasionally. This was due to the practice of babies under phototherapy being given extra fluids routinely to prevent dehydration, whereas the no-treatment group only had supplements when the mother was unable to feed her baby or wanted to sleep at night, for example. Extra fluids are also given to help control the bilirubin levels of jaundiced infants, but this effect is debatable (101,109).

The treatment group also had approximately one less feed per day than the no-treatment group. The explanation for this may be that, even though the mothers with babies under phototherapy are encouraged to feed their infants on demand, after the first day or two they become tired going to the nursery so frequently and thus it becomes harder to do so. Also the baby is sleepy whilst under the lights. Therefore, by the time of the first interview, which was generally on day three of the baby's life, the mothers were not breastfeeding quite as much. This is the opposite to what should be happening i.e. part of the treatment for neonatal jaundice is to encourage the intake of fluids, including breast milk. However, the treatment infants were being supplemented quite frequently, and so the volume of their fluid intake probably was not that low or that different from the no-treatment group.

The final difference between the study groups which is

probably due to the jaundice and its treatment is that the treatment group stayed approximately one day longer in hospital. This extra time was due to the infants bilirubin levels being lowered through the use of phototherapy. In a cost conscious society the number of extra dollars this fact represents is a matter for consideration. Home phototherapy units have recently undergone trials (52-54) and these are less expensive than keeping an infant in hospital. They are also safe, effective and highly acceptable to parents, particularly when the mother is breastfeeding and wishes to continue this in the comfort of her home and not be separated from her infant.

Successful Breastfeeding

The treatment and no-treatment groups were very similar with respect to background sociodemographic variables and, therefore, no adjustments for potential confounding factors were made when analysing the criteria for successful breastfeeding.

The major purpose of the study was to look at the success of breastfeeding for the mother-child pairs in whom the infant had and had not had jaundice requiring phototherapy. Four criteria were examined in order to define "success of

breastfeeding". They were, as previously stated: (1)the duration of breastfeeding, (2)premature discontinuation of breastfeeding, (3)problems during the breastfeeding experience and (4)a subjective rating by the mothers of their breastfeeding experience.

The reason that these four criteria were chosen, as opposed to solely the duration of breastfeeding which is often used interchangeably with the term "success of breastfeeding", is that success is a multidimensional concept. It frequently depends on whose point of view one adopts as to whether or not something is termed "successful". How long a mother breastfeeds for is of particular importance to health professionals, whereas a mother may feel that she has had a positive experience provided that she has breastfed for as long as she desired to. Health professionals may also take into consideration the number, type and severity of problems the mother encounters with her child before commenting on a mothers breastfeeding experience and this may also affect how the mother regards her breastfeeding efforts. Again from the mothers point of view, her overall subjective rating of the breastfeeding experience is important to consider before one can make a judgement on success. Therefore, the four criteria were an attempt to include some of the dimensions of the term "success".

As stated, one of the criteria for successful breastfeeding was the duration of breastfeeding and this group of women was likely to breastfeed for a reasonable length of time due to the following characteristics of the group. They were well-educated; the majority were not of a low socioeconomic status; they were, on average, older rather than younger; the majority fed their babies on demand; and approximately half of them had breastfed their infant in the caseroom. These factors have been associated in the literature with an increased duration of breastfeeding. As these factors were mostly not significantly different between the study groups, the two groups were likely to breastfeed for similar lengths of time.

Also almost half of the women had had a previous positive experience with breastfeeding and were, therefore, likely to be successful breastfeeding the study infant. This would particularly be the case as those who had previously breastfed a child had generally done so within the last couple of years. Approximately half of the mothers stated that the reason they were breastfeeding their infant was that it was best for the baby. This showed a concern for the infants well-being and indicated that the mothers were probably quite likely to be successful in breastfeeding because they realised the benefits it produces for their child. A similar percentage of mothers i.e. approximately 50%, stated that it was their own feelings

that influenced them to breastfeed and, therefore, the motivation to breastfeed is quite high in this group which would again probably lead to a successful breastfeeding experience. If information on breastfeeding varies quite considerably depending on its source then this could lead to confusion about matters concerned with breastfeeding, stress and possibly adoption of incorrect advice leading to unsuccessful breastfeeding efforts. However, the majority of the study sample stated that the information they had received had been consistent and so this potential problem was mostly avoided.

In summary, this group of women was fairly likely to be successful breastfeeding, particularly as the hospital they were in is a family oriented hospital and the staff were reported by all of the mothers to be supportive of breastfeeding.

The success of breastfeeding for the treatment and no-treatment groups was then considered and will be reported under the four criteria of success.

1) Duration of Breastfeeding

Both the treatment and no-treatment groups breastfed for similar lengths of time. Therefore, in this respect they

were equally successful at breastfeeding. This indicates that, even if phototherapy had disrupted breastfeeding, the effect was insufficient to cause early cessation of breastfeeding.

Very few women had stopped breastfeeding by six weeks, which contradicts what some other studies have found (72-74,79,83). Almost half of the sample had discontinued breastfeeding by six months, however. This is similar to some reports in the literature and less than others (69,76,82). Reported breastfeeding at these times may or may not have included supplementary bottles. Rates were not given for pure breast and mixed feeders separately, as there were very few pure breastfeeders and the percentage of each group who were supplementing their infants was similar at each of the first three interviews. Also at six months it was felt that supplementation would be a regular, usual occurrence for many infants and so would not assist in determining any differences in the success of breastfeeding between groups.

As the treatment group was possibly slightly older than the no-treatment group one would expect that if there were any differences between the groups in the duration of breastfeeding it would be the treatment group who would breastfeed for longer. As stated, this was not the case.

The recommendation for a satisfactory period of breastfeeding is four to six months (112,113,114). 67.5% (n=52) of the total sample were still breastfeeding at four months and 50.6% (n=39) at six months. Therefore, the majority of the women breastfed for as long as is recommended.

2)Premature Discontinuation of Breastfeeding

Almost one third of the total sample could not be used in the analysis of this criterion, which reduced the likelihood of finding a significant difference between the groups even if a difference did exist. There was, in fact, no significant difference between the treatment and no-treatment groups in the proportion of women who had discontinued breastfeeding prematurely. However, table 15 indicates a possible tendency for relatively more of the treatment group to have stopped prematurely, but data was available on fewer of this group than of the no-treatment group. If this tendency were, in fact, significant it would have supported the hypothesis of decreased success of breastfeeding due to jaundice requiring phototherapy.

The fact that quite a few of the mothers from the total sample did discontinue breastfeeding before they had planned to probably indicates one or a combination of two factors: (1) the mothers expectations of how long they would breastfeed for

were unrealistically high or (2) the mothers experienced enough difficulties with breastfeeding to make them stop.

3) Problems During Breastfeeding

The first category under this heading was "lactational crises". These are often brought about by stress or tiredness of the mother. Therefore, if there were any effect of jaundice requiring phototherapy in disrupting breastfeeding one would expect this to be seen at the second interview i.e. during the supposed time of maximum adjustment and stress. However, there were no significant differences between groups at this second interview for those women who had had one or more lactational crises, for the duration of lactational crises and for the frequency of such crises. There was also no difference in the mean stress score between the two groups which supports the above finding and indicates that an infant having had jaundice and having been under phototherapy does not cause enough stress or disruption of breastfeeding to increase the overall stress level of the mother.

However, the treatment group did have more women who had experienced one or more lactational crises between interviews two and three, compared with the no-treatment group. Therefore, it may be that the assumption of maximal stress in the initial period after returning home from the hospital is

not a correct assumption. The mothers may feel more tired and stressed later on once the initial enthusiasm, on the part of family and friends, for helping the new mother, quietens down and the mother has to do more by herself. If the breastfeeding experience had not started well for the mothers whose infants had been jaundiced and under phototherapy, then this stage could be the point at which this shows up. However, this difference may not be practically significant. The frequency and duration of lactational crises between interviews two and three was the same between groups. Therefore, once a mother had had a lactational crisis there was a similar likelihood of the same number of lactational crises being experienced and for the same length of time.

In both groups there was an increase in the percentage of women who had experienced at least one lactational crisis from interview two to that reported at interview three. This may be explained by a growth spurt which commonly occurs at three weeks of age (115) which was after interview two but prior to interview three. At this time some mothers feel that they have too little milk for their child as he/she is frequently demanding more.

Most of the women did not suffer any breast problems between the first two interviews and a slightly higher percentage said that they had not had any breast problems

between interviews two and three. This trend may indicate that as the mothers gain in experience breastfeeding the likelihood of breast problems decreases. Breast problems may lead to cessation of breastfeeding and as only a few of the women experienced breast problems the probability of them stopping breastfeeding in the first six weeks was reduced. It was not possible to analyse whether or not breast problems caused an early discontinuation of breastfeeding, because only nine women stopped breastfeeding in the first six weeks. However, there may be an indication that breast problems are more common in those who stop breastfeeding early, because the percentage of this group (55.6%; n=5) who had not experienced breast problems in the period between interviews during which they had stopped breastfeeding, was low, but numbers were too small to test this assumption.

Most of the other problems encountered by the mothers during their initial six weeks of breastfeeding were minor, such as the baby having a rash or being fussy. They were perceived as minor by most of the mothers too, as shown by the fact that only about one in five of them sought advice for any of their problems. The no-treatment group had sought more advice for problems in general at interview three and mostly for the "other" problems. This may be a spurious effect or it may indicate that the no-treatment group, possibly having had less encouragement and teaching when they started

breastfeeding, became more concerned over minor matters compared with the phototherapy group. These statistically significant differences, though, may not be of practical importance as the total number of women who sought advice at this stage was not very high.

When the mothers did seek advice for a problem prior to the second interview it was primarily for a breast problem. This was maybe to be expected as during that time the mothers are in the initial stages of establishing the breastfeeding routine with their infants and so may well encounter problems, such as engorged breasts or sore nipples. There was no difference in whether or not advice was sought nor in the type of problem it was sought for between the two groups. Overall between interviews two and three the advice was sought relatively more frequently for the "other" problems with the infants, possibly due to breast problems being resolved once breastfeeding was well established. When the two study groups were considered separately, however, it was only in the no-treatment group that advice was sought at this stage for an "other" problem.

Overall the advice given concerning a specific problem did help to alleviate it, particularly at the third interview stage. This may be because the problems were not as significant and so were easier to alleviate or because the

time period that the question referred to was longer than that at interview two and so there was more time for the problem to be resolved.

4) Subjective Rating of Satisfaction with Breastfeeding Experience

The subjective rating score was achieved by summing the scores from four separate statements for which the mothers had to state how strongly they agreed or disagreed with the statement. The four statements involved considering the breastfeeding experience from the point of view of the infant itself, the other family members and the mothers feelings. Lower scores were indicative of a higher satisfaction with the breastfeeding experience. Both study groups were highly satisfied with their experience at interview two and three. As most of the mothers had not experienced many major problems during breastfeeding they were more likely to be satisfied with the breastfeeding experience. This may also apply vice versa i.e. the more satisfied a mother is the less stressed she feels and the fewer problems she is likely to have.

The mean satisfaction score for the early discontinuers was greater than for those who breastfed for longer than six weeks, but it was much more varied and there were only a few in this group. However, it would be interesting to examine

the question of how important the mothers subjective rating of her breastfeeding experience is as an indicator of the risk of early cessation of breastfeeding. If these four statements could be used as a risk indicator then they could be asked simply and quickly and necessary measures taken where appropriate.

Summary of Success Comparison

Taking the four criteria for successful breastfeeding into consideration together, it can be seen that there were no major differences between the treatment and no-treatment groups i.e. neonatal jaundice requiring phototherapy did not decrease the success of breastfeeding. As the four criteria produced similar conclusions the result of no effect on breastfeeding is very likely to be a valid one and not from chance.

It may be that neonatal jaundice requiring phototherapy does indeed have no adverse effect on the success of breastfeeding. However, there may be other possible explanations for this finding, when the hypothesis was that neonatal jaundice requiring phototherapy does decrease the success of breastfeeding. First of all, the mothers with infants under the phototherapy lights may actually receive more teaching and encouragement from the nurses. This is

because every time the baby is taken back to the nursery after feeding, the nurses enquire about how well the baby has fed and there is more interaction about breastfeeding between the nurses and the mothers.

Also as the baby has jaundice and is away from the mother so much whilst it is under phototherapy it becomes even more special to the mother. Therefore, the mothers may become more sensitive to the infants demands and wanting to give the infant extra attention, so that a stronger relationship is established, which may well affect the breastfeeding experience. Another part of the explanation may be concerned with the fact that when the baby is under phototherapy the mother is able to rest more. The mother may, therefore, be less stressed and may take in more information about breastfeeding; both of these factors may lead to fewer problems during breastfeeding than would be expected. Indeed, the mothers were probably not stressed by their infants jaundice, as previously discussed. Overall these factors may compensate for any deleterious effects resulting from phototherapy.

However, there may be quite a different reason for no difference being found between the groups in the success of breastfeeding. It may be that the length of time that the infants were under the phototherapy lights was insufficient to

cause any deleterious effects. Further research would be needed to answer this question. If it were found that longer periods of treatment did disrupt breastfeeding then this would be a factor for the health professional to consider when taking care of jaundiced infants. Elander and Lindberg (65) found that separation of mother and infant seemed to decrease the duration of breastfeeding, but their study infants were separated for a mean of 3.3 days, which is slightly longer than in the present study.

One of the suppositions inherent in the hypothesis that neonatal jaundice requiring phototherapy decreases the success of breastfeeding was that the infant having jaundice and being treated for it would stress the mother which would in turn disrupt the breastfeeding. However, when the stress levels of the mothers were measured at the second interview, which was assumed to be a time of heightened stress, they were not found to be different between the groups. This may indicate that once the infant has finished phototherapy the stress factor is no longer present and so would not show up at the second interview. However, it may also mean that the mothers were not, in fact, stressed by their infants jaundice and treatment. This may be due to factors previously mentioned, combined with the supportive attitude of the staff.

Factors Influencing the Duration of Breastfeeding

Regression analysis was used to look at the factors in this study which influenced how long a mother breastfed her baby. Variables which were thought to affect the duration of breastfeeding and which were collected in the initial stages for each mother, were entered into the analysis. Only two variables were significant i.e. whether the baby was fed on a schedule or on demand, and the age of the mother. Those who fed on demand breastfed for approximately one month longer and the older mothers breastfed for longer.

Those mothers who breastfeed on demand may do so for longer than those who breastfeed by a schedule for several reasons. Demand feeding helps to establish lactation in the initial days and, therefore, this may encourage the mother sufficiently so that she desires to continue rather than stop at an early stage. Also demand feeding may be associated with the mother's beliefs about breastfeeding and what is important for the baby i.e. she may be determined to do the best for her infant and this is interpreted by her as feeding on demand and feeding for a reasonable length of time. Older mothers may breastfeed for longer, because they are more stable and so less likely to be embarrassed about breastfeeding in front of other people. Another factor may be that younger mothers are not in as secure a financial

position, as they and their partners have not worked for as long and, therefore, they need to return to work sooner. Thus they discontinue breastfeeding earlier. The explanation probably does not involve them having other children and so more experience, as the presence or number of other children was not significant in the regression analysis.

As more of the phototherapy group breastfed on a schedule one might have, therefore, expected them to breastfeed for a shorter time overall. As previously mentioned, though, this was not the case. However, it is interesting to note that those women breastfeeding on a schedule at interview one breastfed for a shorter time, because frequently these were mothers in the treatment group who fed their infants on a schedule probably only because their babies were under the lights. The effect this had on the duration of breastfeeding probably suggests that the mothers continued feeding on a schedule which has been associated with a lower duration of breastfeeding. However, there must have been sufficient numbers of other women in the treatment group breastfeeding on demand for a long period to counteract the effect on duration of breastfeeding of those who breastfed on a schedule.

However, even those who fed on a schedule initially breastfed for approximately four months which is a satisfactory length of time to breastfeed for. Both of these

variables were also found in the literature to affect the duration of breastfeeding. Other variables which have been associated with an increased duration of breastfeeding, such as formula supplementation, length of hospital stay and maternal education, were not, however, found to be significant in this study.

CHAPTER 6

CONCLUSIONS

Neonatal jaundice requiring phototherapy was found to have an impact on the feeding routine of the infants. Generally, those babies under the phototherapy lights fed less frequently and so had fewer breastfeeds per day, but were supplemented more often and they were fed more on a schedule. The reasons for these effects centre around the baby being separated from its mother whilst under the lights, which also make it sleepy as well as dehydrated.

However, despite these influences on the feeding routine of the mothers and infants, neonatal jaundice requiring phototherapy did not decrease the success of breastfeeding. Not many of the women discontinued breastfeeding at an early stage, although some of them did stop before they had planned to. Overall, the phototherapy and no-treatment groups had similar numbers and types of problems during breastfeeding and were very satisfied with their breastfeeding experience. Therefore, breastfeeding for this sample of mothers as a whole was successful.

There may be several reasons to explain why phototherapy did not decrease the success of breastfeeding: for example,

the length of treatment may not have been long enough to have an effect, the mothers with infants under the lights may have received extra teaching and encouragement, and the babies under the lights may have become more special to the mothers and so a stronger relationship might have developed.

CHAPTER 7

RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

A consideration of the limitations of and results from this study, and of the literature, indicate areas for recommendations and for further studies:-

1) There was a significant number of infants who were being supplemented in the hospital. This is a practice to be discouraged as far as possible, because of the effect it may have on the duration of breastfeeding (70,79) and on the establishment of lactation.

2) The temporary discontinuation of breastfeeding seen in a few of the sample is not generally recommended, because of the risk of breastfeeding not being resumed (61).

3) The mothers frequently did not feel very informed on neonatal jaundice or its treatment. Therefore, it is recommended that hospital staff assess the mother's level of knowledge and whether or not she desires further information, particularly as the mothers may not be willing to "bother" the staff about these matters.

4) Home phototherapy units should be given further

consideration. They could reduce health care costs and be more acceptable to mothers who wish to be at home with their baby rather than in the hospital, whilst the baby is being treated.

5) There were very few infants in this study who underwent the phototherapy in the mother's room. This has the potential to be a more satisfactory method of treatment for the mothers and one which would enable breastfeeding to continue more easily. A larger sample size is required in order to compare the acceptability, feasibility and effect on breastfeeding of phototherapy units in the mother's room as opposed to in the nursery.

6) Further research is needed into the guidelines for initiating and discontinuing phototherapy, as this is still a very subjective area of treatment. The suggestion of Lewis et al deserves consideration as this would decrease the number of babies being treated with the lights. It would also postpone required treatment until breastfeeding was more estabilshed and the mothers were not depressed.

7) The length of time that the infants were treated for in this study was quite short and, therefore, the effect of longer periods of phototherapy on breastfeeding should be studied. It may be found that phototherapy only disrupts

breastfeeding if the infant is separated from the mother in this way for a certain length of time. Therefore, particular attention would have to be paid to the mother when her baby was under the lights for an extended period.

8) No difference in the stress scores was found between the phototherapy and no-treatment groups at the second interview. Studies are needed to determine whether or not jaundice requiring phototherapy causes the mothers stress at the time of treatment i.e. whilst still in the hospital. This information would be of value to hospital staff in understanding and caring for the mothers. It would also be important to measure the stress of mothers at different stages in their breastfeeding experience. This could help determine key stages at which mothers may require extra encouragement from health professionals. For example, at six weeks in this study more women in the treatment group had experienced one or more lactational crises in the preceding period; this may have been due to increased stress.

9) An adaptation of a stress index for parents with older children was used in this study and was determined to be reliable and valid for this population also. However, a more appropriate index could be developed to suit mothers with very young infants. Once this was completed and tested for reliability and validity it could potentially be used in

several areas, such as predicting problems with breastfeeding in order to give increased support, indicating the possibility of child abuse and assisting health professionals in determining if and where problems are arising.

10) The mothers subjective rating of her breastfeeding experience, as defined by the four statements used in the study, could be studied further. It may be that the subjective rating is an indicator of the risk of early cessation of breastfeeding. If this is found to be correct then the simple questions could be asked easily and quickly, and support given where appropriate.

11) This study considered the effect of jaundice requiring phototherapy on breastfeeding. However, it cannot be determined from these results if there were any effects of the jaundice and the phototherapy separately. This would require a much larger sample size and for bilirubin determinations to be done regularly on all infants in order to assess all of those who were jaundiced. There would need to be three study groups: the no-treatment group who were not jaundiced, the no-treatment group who were jaundiced and the treatment group.

12) The length of follow-up in the present study was six months. Although no difference in the duration of breastfeeding was found between the two groups, another study

with a longer follow-up period would be required to fully answer the question of the effect of jaundice requiring phototherapy on the duration of breastfeeding.

13) The sample size in this study was relatively small and so any subtle effects of jaundice requiring phototherapy could not be detected. A larger sample would enable the researcher to analyse the criteria for successful breastfeeding in more depth; for example, the numbers of women in the subgroups of the criterion "problems during breastfeeding", were quite small and so analysis was limited.

14) This study was done at only one of the hospitals in Calgary. Therefore, the generalisability of the results are possibly limited to similar populations of mothers and infants, and to hospitals where the treatment regimes and emphasis on breastfeeding are similar. The same research study done in a hospital where these factors were dissimilar would enhance knowledge on this matter.

Phototherapy may only decrease the success of breastfeeding when the mothers belong to a group who are less likely to be successful than the group in this study: for example, mothers who are less well educated, of lower socioeconomic status and younger. A study should be completed on such women to determine whether or not the

results differ from the present study. If the results indicate a decreased success of breastfeeding due to phototherapy, then this would be an indication for increased support from the health professionals for such mothers.

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APPENDIX A

POSTNATAL COMPLICATIONS SCORING SHEET

IDENTIFIER:
ITEMS:

	Yes	No
1) Respiratory Distress:		
2) Positive or Suspected Infection:		
3) Ventilatory Assistance:		
4) Noninfectious Illness or Anomaly:		
5) Metabolic Disturbance:		
6) Convulsion:		
7) Hyperbilirubinemia or Exchange Transfusion:		
8) Temperature Disturbance:		
9) Feeding Within 48 hrs (yes/no reversed):		
10) Surgery:		

TOTAL:
(raw score)

Converted
Score:

Conversion Table

raw score	converted score
10	160
9	104
8	87

APPENDIX B

CONSENT FORM

I give my consent to Mary Hodges to participate in this research project.

The nature of the study has been explained to me. I understand that I will be interviewed on three occasions (once in the hospital, once in my home and once by phone) and that the total time for the interviews will be approximately one hour. I understand that the questions will be concerning my new baby and breast feeding.

I understand that the health care which I or my baby receive will in no way be jeopardized by my participation in or withdrawal from this study.

I also understand that there will be no mention of my name in the final report and that any personal information I give will be kept confidential.

Finally, I realize that I am free to withdraw from the study at any time.

Signed:.....
Date:.....

APPENDIX C

LETTER TO MOTHER'S PHYSICIAN

Department of Community Health Sciences,
University of Calgary.

Dear Dr. ,

Ms. has agreed to participate in the study on the impact of jaundice requiring treatment on breast feeding in the newborns. The study involves three interviews: one in the hospital, one by phone to her home and one at her home. The interviews will basically concern demographic data and information related to breast feeding. Some information will also be collected from her and her baby's medical records. I hope that you do not have any objections. If you require any information further to the proposal I sent out earlier, then please do not hesitate to contact me (270-4427), Dr. R.S. Sauve (284-6938) or Judi Romany (270-1620).

Thank you.

Yours sincerely,

(Mrs. Mary Hodges)

APPENDIX D

Interview #1

Hello, my name is Mary Hodges and I am from the University of Calgary. I am doing a study on women who have just had a baby and who are breast feeding. I will be doing three interviews over a period of six weeks - the total time for the interviews would be approximately one hour. Would you be willing to participate?

(if "yes" or want more information then continue)
The interviews will take place here in the hospital, in your home shortly after you return home and then by phone when your baby is about six weeks old. I will mainly be asking questions related to breast feeding, such as why you are breast feeding, how frequently your baby feeds and whether or not you have breast fed any other children. Also I will be collecting some basic information from medical records.

(check if willing to participate; sign consent form; arrange interview time)

First of all, I would like to ask you some general questions about yourself and your family; then some questions about breast feeding (and your baby's treatment-if appropriate).

1) What is the name of your new baby?
(use during interviews) .....

2) How many grades of school have you completed? .....

3) Have you had any further training?
1 no .....
2 tech/trade school .....
3 college .....
4 university .....
5 other .....

4) Were you working outside the home before you were pregnant with "name"?
1 yes .....
2 no .....
(if "yes" go to #5; if "no" go to #6)

(5) What was your occupation? .....

6) What is your husband's occupation? .....

7) Have you any other children besides "name"?
1 yes .....
2 no .....
(if "yes" then go to #8; if "no" go to #9)

(8) (a) how many other children do you have? .....
(b) how old is each child? (in years) .....
.....
.....
.....

(c) did you breast feed any of these children? 1 yes .....
2 no .....
(d) if "yes" to (c): how many children did you breastfeed? .....
(e) did you breast feed your previous child? 1 yes .....
2 no .....
(f) if "yes" to (e): how long did you breastfeed that child for (in months)? .....
how would you rate that time of breastfeeding?
1 good .....
2 satisfactory .....
3 poor .....
if (d) was >1: was your previous breast-feeding experience "typical" of you and your children? 1 yes .....
2 no .....

9) What were your reasons for choosing to breast-feed "name"? (can check >1) 1 best for baby .....
2 to lose weight .....
3 "natural" .....
4 everyone else is .....
5 convenient .....
6 other (specify) .....

10) What was the most important reason?
1 best for baby .....
2 to lose weight .....
3 "natural" .....
4 everyone else is .....
5 convenient .....
6 other (specify) .....

11) Who/what influenced you the most in your decision to breastfeed?

1 husband .....
2 other family member .....
3 friend .....
4 doctor .....
5 prenatal classes .....
6 previous experience with breastfeeding .....
7 reading books on breastfeeding .....
8 own feelings .....
9 other (specify) .....

12) Are the hospital staff being supportive of your desire to breastfeed?

1 yes .....
2 no .....

13) How long do you plan to breastfeed for? (in weeks) .....

14) Do you breastfeed on schedule or on demand?

1 schedule .....
2 demand .....

15) How frequently do you breastfeed "name" at present? .....

16) Are you supplementing "name's" breastfeeds with any other type of feed?

1 yes .....
2 no .....

(if "yes" go to #17; if "no" go to #18)

(17) (a) what type of supplementary feed?

1 formula .....
2 water .....
3 other (specify) .....

(b) how frequently do you give these feeds? .....

18) Are you on any medications at present?

1 yes .....
2 no .....

(if "yes" go to #19; if "no" go to #20)

(19) What is the name of the medication? (if don't know name then record type) .....

20) For the mothers whose babies are not undergoing phototherapy: is your baby jaundiced?

1 yes .....
2 no .....

(if "no" then go to #27; if "yes" then go to #21)

Questions 21-26 for all mothers with jaundiced infants

21) If there are other children in the family: did any of your other children have jaundice as a baby?
1 yes .....
2 no .....

22) How informed would you say you are on the nature of jaundice in babies?
1 very well informed .....
2 well informed .....
3 slightly informed .....
4 uninformed .....
5 don't know .....

23) How much would you say you know about the treatment of jaundice in babies?
1 a great deal .....
2 quite a lot .....
3 not very much .....
4 nothing .....
5 don't know .....

24) How serious do you understand "name's" jaundice to be?
1 very serious .....
2 moderately serious .....
3 serious .....
4 not serious .....
5 don't know .....

25) Have you been asked to temporarily stop breastfeeding for any reason?
1 yes .....
2 no .....

(if "yes" go to #26; if "no" go to #27)

(26) Are you expressing your milk?
1 yes .....
2 no .....

27) How consistent was the information you received on these following matter(s) from physicians, nurses, family and friends?

(a) breastfeeding
very consistent .....
consistent .....
inconsistent .....

(b) the nature of jaundice
very consistent .....
consistent .....
inconsistent .....

(c) the treatment of jaundice
very consistent .....
consistent .....
inconsistent .....

Interview #2 (and Newborn Questionnaire)

Hello, I am Mary Hodges from the University of Calgary. I asked you some questions about breastfeeding when you were still in hospital after you had had your baby. I have come to ask you some more questions about breastfeeding and "name".

1) Are you still breastfeeding? 1 yes .....
2 no .....
(if "yes" go to #2; if "no" go to #2 on interview 3)

2) How frequently are you breastfeeding "name"? .....

3) Are you supplementing "name's" breastfeeds with any other type of feed? 1 yes .....
2 no .....
(if "yes" go to #4; if "no" go to #5)

(4) (a) What type of feed are you supplementing with?
1 formula .....
2 fruit juice .....
3 water .....
4 other (specify).....

(b) How frequently do you give these feeds?.....

5) Have you noticed any times when you seemed to have too little milk for "name"? 1 yes .....
2 no .....
(if "yes" go to #6; if "no" go to #7)

(6) (a) How many times has this happened since you started breastfeeding? .....

(b) How long did the/each episode last? .....

7) Have you had any breast problems?
(can check >1)
1 none .....
2 engorged breasts .....
3 tender nipples .....
4 cracked nipples .....
5 inverted nipples .....
6 other (specify) .....

8) Have you had any other problems in breast-feeding besides those you have just indicated (too little milk/breast)?
1 yes .....
2 no .....

(if "yes" go to #9; if "no" go to #10)

(9) What problems have you had? (specify) .....
(e.g. family problems caused by new baby, difficult baby)

10) Have you sought advice for any of these problems?
1 yes .....
2 no .....

(if "yes" then got to #11; if "no" go to #12)

(11) (a) Which problems did you seek advice for? .....

(b) Did the advice help to alleviate any of the problem(s)? (specify which ones have been alleviated or not) .....

12) Are you on any medications at present?
1 yes .....
2 no .....

(if "yes" go to #13; if "no" then stop interview)

(13) What is the name of the medication? .....
(if don't know then record type)

Interview #3 (by phone)

Hello, this is Mary Hodges from the University of Calgary and I've called to ask you the final set of questions about breastfeeding.

1) Are you still breast feeding? 1 yes .....
2 no .....

(if "yes" go to 3; if "no" go to 2)

(2) (a) When did you stop breastfeeding? .....

(b) Why did you stop breastfeeding?
1 insufficient milk .....
2 breast problems .....
3 baby rejected breast .....
4 inconvenient .....
5 doctor's advice .....
6 back to work .....
7 baby ill .....
8 mother ill .....
9 other (specify) .....

3) How frequently are/were you breastfeeding "name"? (present time or just before stopped breastfeeding) hourly during the day .....
hours sleep at night .....

4) Are/were you suplementing "name's" breastfeeds with any other type of feeds? (present time or just before stopped breastfeeding)
1 yes .....
2 no .....

(if "yes" go to #5; if "no" go to #6)

(5) (a) What type of feed are/were you supplementing with? 1 formula .....
2 fruit juice .....
3 water .....
4 other (specify).....

(b) How frequently do/did you give these feeds? .....

6) Have you noticed any times when you seemed to have too little milk for "name"? 1 yes .....
2 no .....

(if "yes" go to #7; if "no" go to #8)

(7) (a) How many times has this happened since I last talked to you (give date)? .....

(b) How long did the/each episode last? .....

8) Have you had any breast problems?
(can check >1)
1 none .....
2 engorged breasts .....
3 tender nipples .....
4 cracked nipples .....
5 inverted nipples .....
6 other (specify) .....

9) Have you had any other problems in breast-feeding besides those you have just indicated (too little milk/breast)?
1 yes .....
2 no .....
(if "yes" go to #10; if "no" go to #11)

(10) What problems have you had? (specify) (e.g. family problems caused by new baby, difficult baby) .....

11) Have you sought advice for any of these problems?
1 yes .....
2 no .....
(if "yes" go to #12; if "no" go to #13)

(12) (a) Which problems did you seek advice for? .....

(b) Did the advice help to alleviate any of the problem(s)? (specify which ones have been alleviated or not) .....

13) Are you on any medications at present?
1 yes .....
2 no .....
(if "yes" go to #14; if "no" terminate interview)

(14) What is the name of the medication? .....
(if don't know then record type)

APPENDIX E

Newborn Questionnaire

In answering the following questions, please think about your new baby.

The questions on the following pages ask you to mark an answer which best describes your feelings. While you may not find an answer which exactly states your feelings, please mark the answer which comes closest to describing how you feel. **YOUR FIRST REACTION TO EACH QUESTION SHOULD BE YOUR ANSWER.**

Unless otherwise indicated, please mark the degree to which you agree or disagree with the following statements by filling in the number which best matches how you feel. If you are not sure, please fill in #3.

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

Example: 1 2 3 4 5 I enjoy going to the movies. (If you sometimes enjoy going to the movies, you would fill in #2)

1) I would breast feed again.

2) Breastfeeding my baby was a positive experience for me.

3) The other members of my household responded positively to me breastfeeding the baby.

4) My baby enjoys/enjoyed breastfeeding.

5) My child is so active that it exhausts me.

6) My child appears disorganized and is easily distracted.

7) My child is much more active than I expected.

8) My child squirms and kicks a great deal when being dressed or bathed.

9) My child can be easily distracted from wanting something.

10) Most times I feel that my child likes me amd wants to be close to me.

11) Sometimes I feel that my child doesn't like me and doesn't want to be close to me.

12) My child smiles at me much less than I expected.

13) My child cries and fusses:
    1. much less than I had expected,
    2. less than I expected,
    3. about as much as I expected,
    4. much more than I expected,
    5. it seems almost constant.

14) My child seems to cry or fuss more often than most children.

15) My child looks a little different than I expected and it bothers me at times.

16) My child does a few things which bother me a great deal.

17) My child is not able to do as much as I expected.

18) My child does not like to be cuddled or touched very much.

19) When my child came home from the hospital, I had doubtful feelings about my ability to handle being a parent.

20) Being a parent is harder than I thought it would be.

21) I feel capable and on top of things when I am caring for my child.

22) My child reacts very strongly when something happens that my child doesn't like.

23) My child easily notices and overreacts to loud sounds and bright lights.

24) My child's sleeping or eating schedule was much harder to establish than I expected.

25) When upset, my child is:
1. easy to calm down,
2. harder to calm down than I expected,
3. very difficult to calm down,
4. nothing I do helps to calm my child.

26) I have found that getting my child to do something or stop doing something is:
1. much harder than I expected,
2. somewhat harder than I expected,
3. about as hard as I expected,
4. somewhat easier than I expected,
5. much easier than I expected.

27) When my child cries it usually lasts:
1. less than 2 minutes,
2. 2-5 minutes,
3. 5-10 minutes,
4. 10-15 minutes,
5. more than 15 minutes.

28) There are some things my child does that really bother me a lot.

29) My child has had more health problems than I expected.

30) My child turned out to be more of a problem than I had expected.

31) My child seems to be much harder to care for than most.

32) I can't make decisions without help.

33) I enjoy being a parent.

34) I feel that I am successful most of the time when I try to get my child to do or not do something.

35) I often have the feeling that I cannot handle things very well.

36) When I think about myself as a parent I believe:
    1. I can handle anything that happens,
    2. I can handle most things pretty well,
    3. sometimes I have doubts, but find that I handle most things without any problems,
    4. I have some doubts about being able to handle things,
    5. I don't think I handle things very well at all.

37) I feel that I am:
    1. a very good parent,
    2. a better than average parent,
    3. an average parent,
    4. a person who has some trouble being a parent,
    5. not very good at being a parent.

38) How easy is it for you to understand what your child wants or needs?
    1. very easy,
    2. easy,
    3. somewhat difficult,
    4. it is very hard,
    5. I usually can't figure out what the problem is.

39) It takes a long time for parents to develop close, warm feelings for their children.

40) I expected to have closer and warmer feelings for my child than I do and this bothers me.

41) When I was young, I never felt comfortable holding or taking care of children.

42) My child knows I am his or her parent and wants me more than other people.

43) I feel trapped by my responsibilities as a parent.

44) I often feel that my child's needs control my life.

45) It is hard to find a place in our home where I can go to be by myself.

46) When I think about the kind of parent I am, I often feel guilty or bad about myself.

47) I am unhappy with the last purchase of clothing I made for myself.

48) I often feel guilty about the way I feel towards my child.

49) There are quite a few things that bother me about my life.

50) I felt sadder and more depressed than I expected after leaving the hospital with my baby.

51) I wind up feeling guilty when I get angry at my child and this bothers me.

52) Since having my child, my spouse (male friend) has not given me as much help and support as I expected.

53) Having a child has caused more problems than I expected in my relationship with my spouse (male friend).

54) Since having my child, my spouse (male friend) and I don't spend as much time together as a family as I had expected.

55) Since having my last child, I have had less interest in sex.

56) Having a child seems to have increased the number of problems we have with in-laws and relatives.

57) I feel alone and without friends.

58) I am not as interested in people as I used to be.

59) I often have the feeling that other people my own age don't particularly like my company.

60) When I run into a problem taking care of my children I have a lot of people to whom I can talk to get help or advice.

61) Physically, I feel good most of the time.

62) Having a child has caused changes in the way I sleep.

63) I don't enjoy things as I used to.

64) Since I've had my child:

1. I have been sick a great deal,
2. I haven't felt as good,
3. I haven't noticed any change in my health,
4. I have been healthier.