Gestational Diabetes: Testing

by KMom

DISCLAIMER: *The information on this website is not intended and should not be construed as medical advice. Consult your health provider. This particular web section is designed to present more than one view of a controversial subject, pro and con. It should be re-emphasized that* ***nothing herein should be considered medical advice.***

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Measurement Conversion Note: The majority of the measurements in this faq are given in the US measurement system of mg/dl, since a great deal of the discussion has to do with the issue of more stringent US treatment protocols. Most of the rest of the world uses mmol/l instead, but it would be too cumbersome to constantly include both measurements every single time. Therefore, while a few important measurements will be given in both systems, the majority will instead be given in the US mode of mg/dl. To convert between systems, a factor of 18 is used. To go from mg/dl to mmol/l, divide by 18 (140mg/dl divided by 18 equals 7.8 mmol/l, for example). To convert from mmol/l to mg/dl, multiply by 18 instead. Apologies to international readers, but the discussion is most pertinent to US mothers who face the controversy of stricter and more invasive treatment protocols and whether they are justified.

Glucose Testing: Common Tests

General Information

There are several different types of glucose testing to see if you have gestational diabetes (gd). Oftentimes, doctors are sloppy in their test terminology, using them interchangeably. *Be aware that your doctor's terminology could differ from what is used here*, and this can get very confusing. The terminology used here is the usage most often encountered by Kmom as she researched gd.

There are generally two modern tests used. One is used to *screen* for gd (to see who needs further testing), and the second is used to *diagnose* gd. A third test is mostly used in countries other than the

USA at this time; it is not considered the correct 'dosage' in the US for pregnancy. The debate over which test to use and what cutoffs are appropriate have been one of the hottest areas of debate in gd (more on that later), but these are the most standard. The tests are:

1. **The one-hour Glucose 'Challenge' Test (50g)** - Used as a screen to see who needs further testing; does NOT diagnose gd unless levels are extremely high. 'Failing' this test does not mean you have gd, just that you need the next test. About 85% of women who 'fail' this test end up passing the second test, so don't panic and assume you have gd based only on the first test; however, 'failing' this test probably means you have *some* abnormal carbohydrate intolerance happening and need to be very careful to eat well and avoid sugar, fruit juice, etc. (see Nutrition section).
2. **The three-hour Glucose Tolerance Test (100g)** - Also called the GTT or OGTT, this test is used to diagnose gd definitively (you must have at least two high numbers to fail, or have an extremely high fasting or post-load number). 'Failing' this one means you DO have gd according to current standards. Again, only about 15% of women who 'fail' the first test end up 'failing' the second and being diagnosed with gd. Of those, only about 15% or slightly more end up needing insulin in most cases, though some studies show much higher rates of insulin use.
3. **{The two-hour Glucose Tolerance Test (75g)** - Ignore this test if you are pregnant and live in the USA. Normally, this test is the STANDARD glucose tolerance test to test for regular diabetes in people who are *NOT* pregnant. In the USA, this test is not considered challenging enough for pregnancy, given the strong influence of pregnancy hormones. In most of the rest of the world, however, it is considered the preferred test, though much debate has raged about this issue. Since the glucose load of 75g in this test is slightly lower than the 100g US test, this means that more gd is diagnosed in the US than in most of the rest of the world; US physicians contend that this is safer for mom and baby, although some others dispute this. Once a gd pregnancy ends, however, this is the post-partum test you should receive 6-8 weeks later, since pregnancy hormones are no longer an issue.**}**

The most common scenario in the US is to give the one-hour challenge test at about 28 weeks of pregnancy (earlier for those at special risk). If a woman fails the one-hour test, she is given the three-hour test a few days later (she should follow a special carb-intensive diet for 2-3 days before the second test; it is not needed for the first test). If she passes the second test, she is not considered to have gd, but it's important to note that women who pass the second test but are borderline **or** have only *one* high number (two are needed for official diagnosis) are still at a somewhat increased risk for large babies or other problems. They would do well to pay strict attention to their diet and exercise regimes. Even women who fail the first test but pass the second test with flying colors are at somewhat increased risk and should probably be quite careful. The bottom line is that if you fail the first test (and *especially* if you are borderline on the second test or you failed the first in the first trimester), you need to take time to be very careful with your diet and exercise. It doesn't make you high-risk, but it does make sense to be cautious. Dietary counseling is appropriate.

Occasionally women want to know 'how to pass' the tests. This is a poor attitude. If you have gestational diabetes, you *need* to know it, and you need to know it based on your normal habits. Don't try and throw the results--this is *very* important. Untreated *severe* gestational diabetes can occasionally cause perinatal death, while treated and well-controlled gestational diabetes is not generally a serious risk. If you have gd, you NEED to know it and take some extra precautions. These are not generally as difficult as most people fear. Don't let your fear keep you from doing the best possible course of action for your baby.

Another vital point is the importance of asking for your EXACT test results as well as the cutoff used on that test. Don't just accept your health provider's word that your test was 'a little high', 'borderline', or that you 'need further testing'. Be an INVOLVED health consumer. Take an active role in your own care. ASK for your own results on the test and what the cutoff was. Sometimes this information can be very useful, and occasionally you can catch errors that the provider misses or watch for questionable treatment practices.

It has happened on occasion, for example, that doctors will assume that if a large woman 'fails' the first test (even with a borderline result), that she will certainly fail the second test and they may proceed

without further testing to strongly interventive treatment and a gd label. *This is size-phobic treatment and must not be tolerated.* Unless the first result is extremely high, the proper procedure is to use the diagnostic 3-hour test and decide on treatment based on *those* results, regardless of the size of the mother. Proper treatment can only be instituted on the basis of *accurate* test data, not assumptions. Solomon (1996) also found that 25% of gd women reviewed in their study were *improperly diagnosed* according to the standard NDDG guidelines. So it behooves ALL women to carefully monitor their treatment and to KNOW their lab results.

In most cases, you will not be able to ask the test results of the lab technicians at the lab; they are not usually permitted to give them to you. However, you have EVERY RIGHT to know your exact results from your health provider and to see all documentation. Some doctors will discourage you from doing so, but it is to your advantage to know. A doctor who discourages this or is threatened by it may not be the best provider to have. In gd, there are many tough treatment questions to decide on and you should be involved in the care decisions made on your behalf. There are *big* variations in treatment protocols between providers; you do not want a doctor who demands a compliant 'sheep' for a patient. A really good provider will welcome a patient who researches the topic and gets involved in her own care. The doctor remains the expert, but given that there are disagreements even among doctors as to how to handle certain issues, it is important for the patient to be a partner in her own care.

More on the One-Hour, 50g Screening Test (Glucose Challenge Test)

In the one-hour Challenge Test, the woman is given a drink of glucola, a very sweet drink, usually carbonated. In many places, it's sort of like super-sweet orange pop, lemon-lime pop, or cola. This particular version has 50g of simple carbohydrates in it--about the carbohydrate equivalent of 3 pieces of bread or one can of soda. You don't have to toss it back in one gulp but they do want you to drink it within about 5 minutes or so. An hour after you *finish* the drink your blood is drawn and the blood glucose (bG) levels checked. The current cutoff for further testing is 140 mg/dl (about 7.8 mmol/l), but many practitioners will order further testing for levels that are in the 130s. A few extremely strict providers will insist on testing even for screening levels in the 120s, but this is probably overkill.

You definitely want to ask what your numbers were to see how close you are to the cutoff. A result well over 200 is generally regarded as a diagnosis of gd (and that you will likely need insulin) and the 3-hour test will be skipped. A number around 200 usually means that you have gd and may well need insulin, but *sometimes* women with results around 200 will pass the GTT anyhow. How exactly to determine a one-hour level above which gd could be diagnosed without the 3-hour test to confirm diagnosis is controversial.

At least one study (Landy 1996) recommended that any number over 185 mg/dl on the first test be considered diagnostic of gd and the three-hour test be skipped in order to spare that mom the inconvenience, discomfort, and expense of testing. This is controversial since a few moms at that level and above will pass the three-hour test anyhow yet would be labeled as 'gd' unnecessarily. Landy et al. noted this (21% of the moms above 185 mg/dl in his study did not end up testing positive for gd) but justified it by noting that these patients "behaved like diabetic patients and...also had significantly greater proportion of large for gestational age infants". Later in this study the authors note that Carpenter and Coustan (1982) found a probability of 95% when women had screens of at least 183 mg/dl, and that Forsbach et al. (1988) "described a progressive increase in the positivity of the GTT when the glucose screen rose above 180 mg/dl." Landy et al. then called for randomized studies "to evaluate the potential impact of of diagnosing maternal carbohydrate intolerance by using only an elevated glucose screen".

If this practice is adopted, it should be noted that there are tradeoffs involved, and they may be significant. Women labeled with gd have more c-sections, even when other factors are controlled for. Their pregnancies are labeled high-risk and are subject to much more intervention and cost, and the mothers have the added burden of guilt and anxiety over the label of 'gd'. They must follow stringent and sometimes inconvenient dietary regulation, and some women have their caloric intake significantly restricted. They must test their blood numerous times per day and undergo more prenatal testing and

anxiety. Finally, their babies undergo much more stringent testing protocols, thus interfering with breastfeeding rates and bonding issues.

Landy et al. even note this in the discussion of why more hypoglycemia is documented in the infants of gestational diabetics. *"These infants, compared with those of nondiabetics, usually undergo early glucose testing and supplementation as part of standard protocols, even when asymptomatic, which might result in a higher rate of diagnosing hypoglycemia."* While it is probably quite smart to test and observe babies of gd pregnancies carefully, the routine supplementation of gd babies "even when asymptomatic" is particularly questionable. Combine the high rates of c-sections among gd mothers and the routine supplementation of their babies, and you have a recipe for very low rates of breastfeeding, an occurrence which is definitely associated with increased risk of many health problems for baby. Considering all of this, the decision to casually label *21 extra percent* of women as having 'gd' when they in fact do not clinically have it is very questionable. Dietary counseling and perhaps retesting in the third trimester may well be appropriate for these women, but the 'gd' label *definitely* carries significant burdens and risks, and these should not be applied lightly and without demonstration of significant benefits. Does treatment of these 'in-between' women really improve their outcome? That is a question of critical importance to this issue and it has yet to be answered.

It is difficult to know how to handle screening results between 186-200 mg/dl, and frankly there is no consensus at this time. It is Kmom's non-expert opinion that the 3-hour test should always be given for any level short of 220+, just to be sure. Having the gd 'label' puts moms and babies at increased risk based on the diagnosis alone; this risk *may* equal or outweigh the greater risk of larger babies in women with positive screens but negative GTTs. In Kmom's opinion, women in this category should be counseled about the risks of larger babies and strongly encouraged to pursue a diabetic diet, but should not be labeled unnecessarily due to the more interventive protocols that may ensue. However, that is only Kmom's opinion and there are certainly some doctors who would disagree. This is an issue that each woman with these results would have to discuss with her provider.

Is there a correlation between how high your first test number is and your chances of having gd? Possibly, but it is not a completely accurate correlation and one that does not always hold up in research. It does tend to seem from anecdotal reports and *some* studies that the higher the result on the first test, the more likely you are to have gd. HOWEVER, it should be noted that research on this question does not show an accurate-enough predictive effect to be used to bypass the three-hour test, except in very high cases (well over 200). Many women with low numbers are still diagnosed with gd and some women with higher results do pass the 3 hour test. (Kmom's result was only about 142 on the one-hour.....but she still had gd.) But the trend does seem to hold true, to a limited extent.

The study noted above (Landy et al., 1996) was also notable for correlating the screening results with the percentage of women with that result who developed gd. Excerpts from this chart are presented below, with the caveat that this was only *one* study, and that other studies have found limited correlation between screening test results and diagnosis of gd. Still, this information may be useful, so it is included here.

CORRELATION OF 1-HOUR SCREEN WITH GD DIAGNOSIS (LANDY 1996)

One-Hour Screening Result	Percentage of Women Diagnosed With GD
140-145 mg/dl	18% had gd
146-150 mg/dl	20% had gd
151-155 mg/dl	30.5% had gd
156-160 mg/dl	34% had gd
161-165 mg/dl	34.4% had gd
166-170 mg/dl	29% had gd

171-175 mg/dl	45% had gd
176-180 mg/dl	55% had gd
181-185 mg/dl	41% had gd
186-190 mg/dl	67% had gd
191-195 mg/dl	67% had gd
196-200 mg/dl	64% had gd
201-225 mg/dl	85% had gd
226+ mg/dl	100% had gd

Most doctors usually do not have you fast before the one-hour test. However, doctors differ in their exact recommendations. Some will tell you to eat breakfast or lunch before coming in, but to let at least 2 hours or so pass before taking the test (in other words, you don't want to be processing the carbohydrates from your breakfast at the same time you are processing the 50g of sugar). This is probably the most sensible course, but there are providers who tell you that it makes no difference whether or not you eat just before the test. There is no agreement on whether to fast before the test, with some sources claiming it makes the test more accurate (ACOG 1994) and others disagreeing. Several studies have noted that eating 2 or more hours beforehand is helpful, especially in populations at higher risk for gd, but these assertions are by no means conclusive (see Greene editorial, New England Journal of Medicine, 1997; Cetin and Cetin, International Journal of Gynaecology & Obstetrics, 1997; Lewis et al., Diabetes Care 1993; Sermer et al., American Journal of Obstetrics and Gynecology, 1994). The best course *seems* to be to eat normally, and then take the test 2 hours or so after your meal. Try to avoid lots of refined sugars and such around the day of the test (though of course you should be avoiding those anyhow!).

More on the Three-Hour, 100g Diagnostic Test (Glucose Tolerance Test)

In the three-hour Glucose Tolerance Test (GTT), it is *very* important to fast beforehand, however. This test is designed to see how your body responds to a lot of carbohydrates all at once----whether your insulin response can keep up with the demand, as it were, since insulin resistance increases in pregnancy. In this test, the woman is given a 100g drink of glucola, *twice* the level of the other test. Four blood draws are usually taken. One draw is in the fasting state, then the next draws are at one hour, two hours, and three hours after drinking the glucola. (Occasionally, a draw will also be done 30 minutes after the drink as well, but that is less common.) Another procedure that sometimes varies is whether they require a urine test at each draw as well.

Things that can interfere with the accuracy of this test include smoking, caffeine, bedrest (meaning no exercise), excessive stress, illness, and many medications (such as prednisone or other glucocorticoids, progesterone supplements, terbutaline, etc.). Also implicated in questions on the test's accuracy is whether the woman consumed adequate carbohydrates for 3 days prior to the GTT.

Generally speaking, the woman is supposed to "carbo-load" for several days before a GTT. This apparently stimulates her body to produce more insulin and be more prepared for the overload of the 100g test. However, *many* doctors do not instruct their patients on this at all, and some even forget to tell the patient to fast ahead of time. In addition, even those who tell their patients to carbo-load do not give consistent advice. Some give a specific diet to follow, specifying exactly how many extra carbs to eat and when (usually >150g--10 servings or more--of carbs per day; remember that carbs in this case includes all starches, fruits, sweets, and dairy products). On the other hand, other doctors just tell the woman to eat a few extra servings of carbs 1-2 days before the test. Be sure to press your doctor for more details on this and question your care closely if the doctor seems careless in attitude towards the test protocols. The official recommendation is to carbo-load for at least 3 days before the test, but since many doctors do not follow this, **the lack of uniform testing conditions is a *major* criticism of this test.**

Exercise also improves your levels of insulin sensitivity, so exercising for several days before the test

could theoretically improve your results if you were borderline, although longer-term exercise is usually required for significant effect. Since you want to have ACCURATE test results based on your NORMAL habits, it is probably not a good idea to increase your exercise pattern significantly, though the official recommendations do not recommend restricting activity either. You want your true test results to reflect the conditions you live under on a regular, daily basis so a one-time sudden surge in exercise is not a good idea and smacks of trying to artificially 'fool' the test. If you do already exercise regularly, then you should continue in your normal patterns but not restrict activity.

For the fasting draw (*before* drinking the glucola), you should have about 10 hours of fasting overnight. If you have less than 8 hours, your bG may still be elevated from food the night before. If you have more than 12-14 hours, your bG may have dipped so low that the body needed to access other bodily sources of energy and the number may be falsely high as a result. Different providers recommend different fasting intervals, but the most common recommendations seem to be 9-10 hours. It may be very important to keep within this time window. Consult your provider.

You should probably eat a small bedtime snack, one that contains protein, shortly before starting your fast. This will hopefully keep your body from dipping too low between your last meal and your fasting test. For example, if your last meal is at 6 p.m. the night before and you do not test until 8 a.m. the next morning, your fasting interval will be 14 hours, and your body may already have had to access other sources of energy and your readings may be falsely high. So try to eat a small snack with protein about 9-12 hours before your test is scheduled in the morning. Protein is important because it slows down the absorption of carbohydrates, giving you a more consistent and long-term supply of energy. Otherwise, you may get a quick spike, then a crash, and then another spike as the body compensates for the lack of energy.

When you go for your 3-hour gd test, be sure to take along lots of reading and work! It can get really boring sitting there for that long. Most labs request that you stay seated and close at hand during the test, so plan a way to pass the time. Try to avoid scheduling this test when you are ill or at a stressful time of day, since stress and illness can significantly affect bG levels. You will also not be permitted to smoke during the test (but of course you should not be smoking during pregnancy anyhow!). During the test, concentrate on breathing and being as relaxed as possible; try not to stress over the test. If you have gd, you need to know it. If you do not have gd, great! Either way, what you need to know are the *results* and stressing over them might raise your blood sugar and is pointless at that stage anyhow. (Easy to say, of course.....!)

GD is diagnosed when *any* of the following three conditions arise:

1. **The fasting number is too high** (usually over 105 but a few labs cut off at 95 or even 90); the test is usually terminated and you will probably need insulin therapy
2. **If *any* *two* of the hourly values exceed the diagnostic levels** currently used (see below)
3. **If any of the values at any time exceed 200** (diagnostic of diabetes; you may well need insulin therapy)

A more difficult issue arises if only one of the post-glucola numbers is high. Technically, this is not considered gd, but research shows that many of these women will develop gd if retested later in the pregnancy or have problems associated with gd. So if only one of your numbers was high, it is probably a good idea to start following a diabetic food plan, just in case, even though technically you do not have gd. You may or may not develop gd later, but the diabetic food plan cannot hurt and is just sensible eating with careful timing. Whether or not to retest for gd later is up to your provider but is probably sensible. Whether the label of 'gd' should be applied in this situation is highly debatable, since the label alone introduces a higher risk (as noted above) and *may* outweigh the possibly increased risk of being slightly below the cutoffs. On the other hand, increased caution is probably appropriate and a gd label might be appropriate in some cases. Discuss it with your provider.

When you are tested, *be sure to ask for your numbers as well as the cutoffs used to diagnose you.* Different practitioners use different cutoffs. The most commonly seen scales are listed below for your reference, but remember that your practitioner may use a different scale. It may be helpful to know if you

are a borderline case or whether your case is more severe, or whether there is a particular pattern of response to the glucose load. If you test negative but some of your numbers are close, it may be a good idea to consider improving your food intake, combinations, and timing. The very fact that you 'failed' the first one-hour test has been shown to have a slightly increased risk (and even more so if you 'failed' it in the first trimester), so careful attention to diet and exercise is probably in order, even if you 'pass' this test.

Glucose Testing: Common Diagnostic Values

Different health providers use different scales to diagnose gd, but these seem to be the most common. These numbers were obtained from the numbers listed in the ACOG (American College of Obstetricians and Gynecologists) guidelines and other scholarly journals. Again, scales used can differ and there is a fair amount of debate about the scales themselves, but these are the most likely to be used in the US. [Internationally, the World Health Organization recommends using the 75g, 2-hour test with traditional diabetic cutoffs, but many USA doctors feel that this leaves too many borderline cases undiagnosed and untreated.]

Again, USA numerical conventions (mg/dl) are used here for simplicity. Converting between systems requires multiplying by 18 (from international to US numbers; 7.8 to 140) or dividing by 18 (from US to international numbers).

TESTING CUTOFF VALUES COMMONLY USED

1-hour glucose challenge test (50g) - 140 mg/dl [7.8 mmol/l]; many providers will order further testing in the 130-140 range as well, and a few will order further testing in the 120-130 range too.

3-hour glucose tolerance test (100g) - NDDG Scale (National Diabetes Data Group), most commonly used scale (ACOG lists this one first)

Reading	Cutoff (mg/dl)
Fasting Draw	105 mg/dl
One Hour Draw	190 mg/dl
Two Hour Draw	165 mg/dl
Three Hour Draw	145 mg/dl

3-hour glucose tolerance test (100g) - Carpenter Scale

Reading	Cutoff (mg/dl)
Fasting Draw	95 mg/dl
One Hour Draw	180 mg/dl
Two Hour Draw	155 mg/dl
Three Hour Draw	140 mg/dl

3-hour glucose tolerance test (100g) - Coustan Cutoffs

Reading	Cutoff (mg/dl)
Fasting Draw	95 mg/dl
One Hour Draw	180 mg/dl
Two Hour Draw	160 mg/dl
Three Hour Draw	135 mg/dl

You see how cutoffs differ! You can be diagnosed with gd on Coustan's scale but not the one most often used by ACOG members. There are also other scales that are modifications or combinations of previous scales, and some researchers want to lower cutoffs even further, which means that more women will be diagnosed in the future. Then throw in the variables of whole blood vs. plasma, capillary vs. venous blood readings, etc., and it can get really confusing.

Originally, O'Sullivan (in the 60s) set the cutoffs for the test based on which women developed 'true' diabetes later in life. He chose these settings based on their ability to predict possible future risk of diabetes, not on their ability to improve fetal outcome because at that time, fetal risk was not really the focus for such testing. In the 70s, studies were done that linked high results on GTT tests to an increased risk of perinatal mortality (though some critics question whether the high death rate was due to the 'gd' or to other confounding factors, which were not adequately controlled for).

In 1979, the first big conference about gestational diabetes occurred, and the O'Sullivan cutoffs (which used whole blood values) were converted to plasma readings (used in modern testing). In the early 80s, some researchers questioned whether these conversions were correct and also whether the cutoffs were low enough. In particular, the fasting level of 105 may be questionable; a fasting level of 95 seems to have a better 'confidence interval' rating in some studies, though not everyone agrees that this should be changed (at this time 105 is the most widely-accepted cutoff). However, a number of researchers have noted that all of these test parameters are derived from the original premise of the ability to predict future diabetes in the mother rather than those that predict the best fetal outcome. They have called for more stringent research that reflects cutoffs based on improvement of fetal outcome, since a number of critics have cast doubts on whether current treatment really improves outcome.

You *really* need to ask which scale your lab and provider use and why; and you also need to GET YOUR EXACT RESULTS as well as the cutoffs used so that you can see where your results fell on the diagnostic scales. Then you can discuss your results more intelligently with your providers. For example, a very high one-hour result followed by steep declines in the two and three hour results can indicate that you may *possibly* be responding in classic reactive hypoglycemic fashion---a strong rise in bG followed by an insulin surge which causes the bG to crash. This strong swing can cause big problems, and is important to know about since it can sometimes be moderated through protein intake. This may need to be considered when prescribing a diabetic food program for you. Another concern under these circumstances is that if you end up needing insulin, you would also need to know to watch carefully for very low hypoglycemic episodes, since you tend to have strong insulin surges and reactions. So looking for certain patterns in your diagnostic test results may help you in your treatment plan.

Carefully look at your 2-hour number. Some studies (Tallarigo 1986; Weiner 1988) have found this number to be particularly predictive of macrosomia later on, so if it is close to normal you may be in better shape than if it is significantly high. If it is quite high, you will want to be very careful with your diet and exercise, you perhaps may need insulin, and you may want to consider especially close surveillance by multiple instances of fetal sonography. However, some research did not find any correlations between the 2-hour number and macrosomia or any other outcome, so more research needs to be done to confirm this correlation. Don't panic if your 2-hour number is high, just be extra cautious.

Another reason why it is very important that you request your exact results and the diagnostic scale used is because doctor error happens. One study (Solomon 1996) showed that nearly 25% of doctors surveyed incorrectly diagnosed gd from patient test results, so doctor error or protocol differences is an important factor too. You need to be sure that your diagnosis is correct and what it was based on. GET YOUR RESULTS.

Glucose Testing: Other Alternatives?

Are there other ways to test for gestational diabetes? Generally speaking, the glucola tests are the accepted way to test for gd. However, a few doctors and midwives will entertain alternatives sometimes, especially for women who have difficulty tolerating the glucola tests (some women get faint or very nauseous). It is controversial whether these are acceptable.

One alternative is the 'jellybean' test, as mentioned in the December 1995 study by Boyd et al. in the American Journal of Obstetrics and Gynecology. In this, 18 jellybeans are given instead of the (50g) glucola drink. The results are supposed to be consistent with the standard test, and patients reported tolerating the sugar load better. However, this method is not widely used. More information is needed.

Occasionally, a special meal will be given, and then the post-prandial blood sugar will be measured after a specified amount of time, but this too is uncommon. A 1995 study by Hughes et al. suggested a new version of a test called a 'fructosamine estimation' and recommended a wider evaluation of this method, but it seems to have been discarded later as ineffective for gd. A 1994 study by Schwartz et al. found that suspending the 50g of glucose in 450 ml of fluid instead of the usual 150 ml of fluid helped improve accuracy while also lessening some of the unpleasant side effects that happen to some women. However, none of these is likely to be pursued.

Some women experience a significant hypoglycemia episode in response to all that sugar. Their blood sugar spikes, then their insulin surges so strongly that they crash, possibly experiencing dizziness, nausea, shakiness, or even fainting. For these women, some providers will accept a simple fasting plasma test or series of tests. In this, a woman will eat normally the day before, then fast overnight. She then goes in for a fasting blood draw the next morning. If the results are over 105 (or 95, depending on the diagnostic scale used), then she is diagnosed with gd; if not, she is judged fine.

The criticism of this is that it provides only a one-time snapshot of her bG levels and doesn't really test her insulin response to food, a very valid criticism. Some women may have normal fastings on some days and abnormal on other days, or they may have normal fasting results but a substantially high response to food. Doing a series of fasting tests can allay the concern over a one-time only fasting result; a fasting plus a post-meal test (or series of tests) would be helpful in establishing a normal response to fasting and postprandial conditions. However, the criticism still exists that a one or two-time test can be significantly influenced by a number of environmental factors and so may not reflect the true state of a woman's carbohydrate tolerance. Judgment on whether the trade-off of less certainty in diagnosis is worth the less-traumatic response to the test will have to be made by each provider and patient.

At least one study (Sacks 1992) found that fasting tests performed better than 50g tests and suggested further study, but this does not seem generally accepted by the medical community. The jellybean test, a series of fasting tests over time, or a fasting plus a post-meal test are all options but are not generally considered optimal and may miss a few cases of gd. A gylcosylated hemoglobin test (hbA1c) is not considered sensitive enough for diagnosing gd (Shah 1982), although it can be useful in establishing good glycemic control during a gd pregnancy or before a subsequent pregnancy and is an excellent idea if considering another child.

At this time, the standard of care for gd diagnosis is the one-hour challenge followed up by the three-hour tolerance test. In a few exceptional cases, a provider may consider alternative tests, but the risk is that a

few cases may be missed and go untreated. Most providers are unwilling to risk that, but exceptions may be made if the woman has unusual circumstances and is deemed to be at low risk in other ways. If you have special concerns about using the standard test, be sure to discuss it with your provider.

A note on old glucose tests *(skip this if you are getting confused between all the various tests and cutoff numbers already!): In the 'old' days, before the modern gd tests and cutoffs, women were most often tested for gd through urine tests. If a woman was 'spilling' sugar in her urine, then she was sent for further testing for diabetes. However, these tests were not very sensitive, and many women who would have been labeled as having gd with today's standards went undiscovered then. So it is difficult to know for sure whether your own mother had gd during her pregnancy with YOU, something that has been found to be quite predictive of gd in the child when she becomes an adult. If your mother DID have gd with you, you know that you are at very strong risk for it; if she was not diagnosed with gd, you cannot establish that she did NOT have it unless the pregnancy was after 1980 or so and the modern tests were used.*

If your mother did have gd back then, she was probably tested on a daily basis only with the urine strips, which simply gave a color reading that indicated a large range that the bG was in. A certain color indicated a range from say, 60-90 mg/dl, etc. In addition (or instead of), she probably went for weekly or biweekly blood draws, which may have been fasting or post-prandial or both. This lack of immediate feedback made careful control very difficult back then. Today, women are MUCH luckier to have the self-blood-glucose monitor available. Studies have shown that careful monitoring several times a day improves bG levels significantly; the immediate feedback of the meters allows instantaneous connection between input and your body's reaction to it, identification of trigger foods and other problems, and identification of hypoglycemic episodes as well. Pricking yourself 4 or more times per day is definitely a pain in the neck (okay, a pain in the hand), but the instant feedback and more careful regulation it offers is VASTLY superior to the testing methods of the past!

At your regular visit to your prenatal care provider, your urine IS still tested. It is tested for protein (in case you are developing pre-eclampsia), white blood cells (in case you have a urinary tract infection), and sugar (in case you are spilling lots of sugar in your urine). Other things such as ketones may be tested for as well. Sugar in the urine on these tests may be perfectly normal---some women spill sugar even when no gd is present. And it is true that many women with gd NEVER spill any sugar in the urine, which is why the blood tests are needed. However, a high percentage of women who spill sugar in their urine do have gd, and since gd can develop at any point in pregnancy from beginning to end, most providers still do 'dip' for sugar in the urine.

To further complicate the issue, there is also a home urine test for ketones, a by-product created when fat stores must be accessed in order to provide enough energy for baby (see the section on Ketone Testing). So if you are discussing tests with your provider or on the internet, it can get very confusing precisely which test is being discussed and what cutoff goes with what test. Be SURE you know EXACTLY what test is being discussed. It is very common for women to mix up their testing information when discussing gd.

Glucose Testing: When?

In pregnancy, the cascade of hormones that effect blood glucose and insulin resistance (prolactin, progesterone, estradiol, human chorionic somatomammotropin, and cortisol are the strongest) generally peak between 26-32 weeks. It is important to find a time to test for gd that catches the majority of gd cases yet still allows adequate time for preventative treatment to head off potentially serious effects. Over the years, the most optimal testing time has been determined to be at about 28 weeks (end of the second trimester) for the majority of women, slightly earlier for women with a multiple pregnancy.

However, if there are other risk factors to consider (age, history of diabetes in family, ethnicity, and yes, obesity), then many doctors choose to administer this test in the first trimester as well. To some larger women, this may seem like a size-phobic reaction and Kmom does have mixed feelings on it, but this *might* be able to be justified, since we *do* have higher rates of previously undiagnosed diabetes. Most of us will test negative, but the exceptions are in such a high-risk category *and* high blood sugar can do so

much damage at this early stage that the trade-off may be worthwhile. If gd or previously undiagnosed diabetes/glucose intolerance is already present in early pregnancy, it will likely worsen as time goes on and preventive action and monitoring will be *extremely* important for the baby's health. So early testing for gd in women with multiple risk factors seems justified as long as it is not abused.

Some providers have the attitude that if you are large, you WILL get gestational diabetes and it's only a matter of time, so they will test constantly in order to catch it immediately. They view us at such risk that they are constantly on edge and feel compelled to overmonitor. The fact is that while we *do* have somewhat higher rates of gd, the majority of large women do not actually get gd (only 1 of 5 get gd in one study; even less in another study). So striking a balance between monitoring 'just in case' and yet not over-monitoring is important.

There is no need to test larger women constantly (some large women have been pressured for a glucose test every month!) *but once in the first trimester and then again at 28 weeks may be reasonable in women with multiple risk factors*. A few providers will also include a test at about 32 weeks or so (since this is when the most powerful hormones peak) for women they consider very high-risk, but this is by no means standard. Although it is unusual, it is indeed possible to pass the gd tests at 28 weeks and yet 'fail' them in the third trimester. For women whose previous test results were fine, testing yet again in the third trimester is overkill and unnecessary, regardless of size. For women whose previous tests were negative but borderline or who have extremely strong risk factors, a further test in the third trimester *might* be justified, but it should not be made on the basis of size alone. Size should not be the determining factor in selecting a further test, though it may be a contributing factor along with other considerations. Judgment must be made on a case-by-case basis.

For example, women (regardless of size) who failed the one-hour test but passed the three-hour test in the first trimester (or who had one raised result on the three-hour test) have definitely been found to be somewhat more at more risk for problems (Meyer 1996; Mello 1997; Rey 1996). It is probably wise to retest them once or twice and to counsel them in the use of a diabetic food plan. Size could be a contributing factor in deciding on further testing in this case but should not be the ONLY factor. Another example can be found among populations at extremely high risk of gd and diabetes (Native Americans, Latinos, etc.)---women of these groups who have had borderline tests plus other factors such as family history, size, or previous gd would probably warrant further testing in the third trimester. But size alone should not be the determinant of frequent testing.

In summary, then, the standard seems to be to test all women for gd at about 28 weeks. **If a woman has other risk factors, it may sensible to test once in the first trimester and counsel the woman about eating on a diabetic food plan regardless of results, and then test again at 28 weeks.** Adding another test in the third trimester when the woman has already tested negative twice is a more difficult call. It might be sensible if the woman has had borderline results, twice failed the one-hour challenge, or has a clustering of strong risk factors, but may be overkill if her previous results have been fine. This is an individual judgment call for the provider and the woman to make, but size alone should not be the determining factor, in Kmom's opinion.

Glucose Testing: Is Universal Screening Necessary?

A difficult and extremely controversial issue in the obstetrics field has been the topic of universal testing (testing ALL pregnant women for gd, regardless of the presence or absence of risk factors). A huge amount of the research literature on gd has been devoted to this issue.

Currently, the American College of Obstetricians and Gynecologists (ACOG) does not recommend screening every pregnant woman in America for gd, though until recently, the American Diabetes Association (ADA) did. The difficulty in testing only those women with risk factors is that a fair percentage of gd cases sometimes occur in women without any strong risk factors and these women would go undetected and untreated, theoretically putting their babies at risk.

Studies differ strongly in their results on the subject. In some studies, a large number of women went undetected and untreated for gd when universal screening was not used (Weeks 1994). In other studies, selective screening found nearly all the cases of gd and universal screening was deemed unnecessary (Helton 1997; Naylor 1997). At this time, the debate has not been settled.

For example, Dr. N. Clemenson wrote in the Journal of the American Medical Association in 1996:

> *In 1986, the American College of Obstetricians and Gynecologists recommended selective screening, but in 1994, they noted the absence of data to support screening and did not make a specific recommendation. Finally, the recently released guidelines from the United States Preventive Services Task Force cite insufficient evidence for or against screening for GDM.*

In reply, Dr. C.D. Naylor and Dr. Mathew Sermer replied:

> *As Dr. Clemenson indicates, there is an ongoing debate about screening for GDM...this heated debate is partly an epiphenomenon of incomplete evidence. For example, like the United States Preventive Services Task Force, the Canadian Task Force on the Periodic Health Examination has concluded that the evidence is insufficient to recommend for or against screening. However, a 1991 survey completed by 206 academic leaders in US obstetrics showed that 97% undertook universal screening for GDM using a 50g glucose challenge test. There was definite consistency in criteria for diagnosis and for treatment with insulin. In contrast, screening and diagnostic practices in the United Kingdom are much more variable, with limited acceptance of the glucose challenge test. We suspect that controversy, along with widespread variations in practice, will persist until definitive clinical studies are completed.*

So there still rages a debate over whether universal screening is really justified. In countries outside the US, it is used only sporadically due to its expense and inconvenience; screening is usually done more on the basis of risk factors. In the US, however, most physicians practice universal screening, in spite of the new recommendations from ACOG and the ADA.

In fact, though, the new 'selective' screening recommendations from ACOG and the ADA nearly amount to universal screening anyhow. Basically, they recommend that universal screening is not needed for women under 25 who do not have any other risk factors such as family history, obesity, ethnicity, etc. Although a small percentage of pregnant women will now not have to go through screening, the VAST majority still will. Whether this is justified or not is still open to debate.

Glucose Testing: Concerns And Criticisms

There are a number of concerns about the current gd testing protocols. Inconsistencies in testing conditions, reproducibility of the tests, whether one test can adequately sample the changing nature of glucose tolerance during pregnancy, the relationship of the test results to fetal outcome, whether testing accurately reflects 'real-life' conditions, the susceptibility of tests results to influence from life factors such as stress and illness, should the diagnostic levels be stricter or looser based on fetal outcome, and the cost-effectiveness of a nearly universal screening program, etc. are all important gd testing issues. There is great debate currently occurring over these concerns.

The inconsistency with which the glucose tests are administered is a ***very*** important criticism. Doctors are ***extremely inconsistent*** in the way they give these tests or tell you to prepare for it. *If a test is not given under uniform conditions, then the results are open for questioning*. Unfortunately, this is not well-addressed in the medical community. Most neglect to have the patient carbohydrate-load before the test and do not specify a consistent fasting recommendation (9 hours, 10 hours, 12 hours, etc.). Some use urine testing in conjunction with the tests, some do not. Some measure at the first half-hour as well as the usual 1 hour, 2 hour, and 3 hour intervals after ingesting the glucola, while most do not. Some

prohibit any movement at all while others permit light walking or activity. Some providers use BG meters to measure the 50g-1 hour test more conveniently in the office, while others consider this invalid. Some providers tell women to fast before the 1hour test, while others tell them to have at least 2 hours between their last meal and the test, while still others tell women it makes no difference at all. Some providers even neglect to mention that the 3 hour test is a *fasting* test, causing women to either have inaccurate results or causing them to need to reschedule the test.

The overwhelming sloppiness with which the medical community administers these glucose tests is a very strong criticism and should be carefully addressed; unfortunately it is an issue that receives little attention in the research literature or from providers in general. And as noted above, another study (Solomon 1996) showed that nearly 25% of doctors surveyed incorrectly diagnosed gd from patient test results, so doctor error or protocol differences is an important factor too.

Also open for questioning is the reproducibility of the test---whether the same results will be obtained each time. Some studies (Harlass 1991) show that the GTT is not very reproducible, which is a significant concern since a woman could conceivably be misdiagnosed, either positively or negatively. This area needs more research. Blank et al. (1995) note that, "*Another problem with conventional screening and diagnostic methods that use the standard glucose tolerance test is that the results are not very reproducible. Thus, there may be false-positive readings, as well as false-negative ones. A large percentage of positive screening tests will be negative upon retesting.*" Since the label of 'gd' has been shown to increase rates of c-sections and other interventions independent of any other complicating factors, careful attention should be paid to the issue of misdiagnoses.

Another concern is whether one test in a pregnancy can catch all the cases of gd, since glucose intolerance tends to increase over the course of a pregnancy. Yet too many tests are cumbersome and overly expensive. The study quoted above (Blank 1995) went on to address this issue by noting, "*Screening tests generally involve one-time sampling, while glucose tolerance may change throughout the course of the pregnancy. The most effective screening would involve a continuum of sampling throughout the pregnancy...however, this approach would be expensive relative to the yield.*"

Furthermore, does the test really test what it purports to test, and is outcome really tied to test results? In some research, the test results clearly seem to be tied to fetal outcome (Landy 1996, plus numerous others), while in other research, the test results do not seem to reflect fetal outcome at all (Garner 1997, plus numerous others). In general there is a tendency for higher results to reflect a higher need for interventions such as insulin and closer prenatal monitoring, but there are a number of cases in which high results on the initial test do not result in a diagnosis of gd or in which fairly low results on the initial test end up with very significant cases of gd. At this time, the relationship between specific test results and fetal outcome is unclear. More research is needed.

Another concern is that drinking 100g of sugar drink is not like real life, and it is more important how your body responds to everyday, real-life conditions. Because sugar (or glucola) is a simple carbohydrate and there is no protein or fat to help slow its absorption, it will produce the most extreme reaction and test your insulin capabilities more. 100g of other carbs, on the other hand, might be absorbed differently, especially if protein or fat is eaten with it.

On the one hand, it is easier to standardize the testing through the use of the glucola and it tests the pregnant woman's reactions to the most extreme stimulation, just in case she is eating a great deal of candy and sugar. On the other hand, the criticism that this doesn't often reflect real-life situations (which rarely include consuming 100g of pure sugar without protein or fats of any kind) is also valid. However, it is not as hard as it seems to take in 100g of carbohydrates of various kinds, so *perhaps* a load of this kind is justified, though it seems to be stacking the deck a bit, since such an occurrence without protein and fats would be unusual. Some providers would prefer that the testing conditions more accurately reflect real-life situations, but the testing for this would be cumbersome and more expensive. The truth is that glucola tests are fairly easy to standardize and more clear-cut to give, and most providers are not willing to indulge in more cumbersome regimens.

No matter what type of test is given, one recurring problem is that many life factors can also influence the

results. Blood glucose levels are extremely susceptible to stress, for example. If you are under a great deal of stress the week of the test or if you don't get a good night's sleep the night of the test, your results can be elevated. Illness can also *substantially* increase your bG levels. Of course, the argument can be made that if your levels are elevated, it doesn't matter if it's due to stress or lack of sleep or whatever---it's still more of a risk for baby. This is true. On the other hand, if you have have been ill, had a bad night or stress that is *not* usual, you might want to ask about postponing the test to another day. Doctors will differ in their response to this, but frankly, most will probably not have you reschedule. This is another point critics use against this kind of testing, though its value is debatable. Other factors that can alter lower glucose tolerance include many medications, caffeine, nicotine, and enforced bed rest. If any of these (or unusual stress or illness) are factors for you, discuss the issue with your provider. Some may be more flexible than others.

Some critics feel that the diagnostic cutoffs used are not strict enough! They note that the diagnosis of gd and testing cutoffs were originally designed only to identify women at greater danger of developing type II diabetes someday, not to find the level of diagnostic cutoffs that promote optimal fetal outcome. As recounted above, the original (O'Sullivan) criteria were derived from tests performed on venous whole blood in the 1960s and were chosen solely for their ability to predict later Type II Diabetes in women. In 1979, the National Diabetes Data Group (NDDG) revised the criteria, and converted the whole blood values to plasma glucose values, some of which are reputed to be in error. Coustan and Carpenter developed an even more stringent set of diagnostic criteria; some providers feel that these data are the preferred set, since extra women identified with gd under the stricter Coustan guidelines had similar risks and outcomes to the women diagnosed under the NDDG criteria (Magee 1993).

So there are THREE main sets of diagnostic criteria to choose from. In order of strictness and number of cases of gd that will be diagnosed (from least to most), they are the World Health Organization's 75g GTT cutoffs, the National Diabetes Data Group's 100g GTT cutoffs, and the Coustan and Carpenter 100g GTT cutoffs. A significant amount of debate in gd research centers on the relative value of each of these. **Numerous sources have pushed the need to find testing cutoff data that is based on fetal outcome instead.** This is a very important, very valid criticism. It may lead to either a tightening or a loosening of diagnostic criteria, depending from whose point of view you look at the problem.

As noted above, some studies have found that current diagnostic criteria and gd treatment protocols have been able to improve fetal outcome, while others have found that diagnosis and treatment does not help or actually harms the outcome. Generally speaking, the influence on fetal outcome has not been as significant as proponents would like. This has led to a raging debate over diagnosis and treatment values. So-called 'conservative' medical providers contend that to *really* improve outcome, diagnostic cutoffs need to be lowered and more aggressive treatment at lower values instituted. The so-called 'alternative' providers sharply question the need to lower values when they contend the current ones aren't doing much good (if any), and may indeed be doing more harm than good. They object to the institution of stringent protocols when proof of efficacy and lack of harm is not (to them) adequate.

Adding further fuel to the fire is the cost-effectiveness issue. Dr. David Hunter presented an analysis of the cost-effectiveness of a universal screening program on reducing the rate of macrosomia in gd at the 1992 International Workshop on Adverse Perinatal Outcomes of Gestational Diabetes Mellitus (as reported by Blank et al., 1995):

> *It has also been argued that a nationwide screening program for GDM would at best have a relatively small impact on the overall incidence of macrosomia. If screening were 100% effective in identifying women with GDM, and if insulin treatment were 100% effective in ameliorating macrosomia, the combined approach would result in only 50 fewer macrosomic babies per every 10,000 deliveries, Dr. Hunter explained. Shoulder dystocia may cause birth trauma, such as brachial plexus injury and fractured clavicle. However, long-term benefits of screening women for GDM to prevent birth trauma caused by shoulder dystocia would be minimal. Although 15-30% of infants with shoulder dystocia suffer injury to the nerves in the brachial plexus, most heal in 1 year; only 0.2-2% of them will suffer permanent nerve injury. One study found that most fractures related to shoulder dystocia are clavicular fractures, which heal without long-term*

> *complications. Of the 50 additional infants identified as macrosomic by a screening program, only 6 of 10,000 would experience shoulder dystocia; only 1 of these 6 would have shoulder girdle injury, which is usually of no long-term significance. Such calculations challenge the idea that a screening program would have any significant long-term effect on perinatal morbidity associated with GDM, according to Dr. Hunter and others.*

To the gd critics, there is a lot of debate about whether gd is even really a legitimate concern, even beyond the cost-effectiveness debate. Many feel it is overdiagnosed, definitely over-treated, and based on shaky research. It is natural in pregnancy to have an increase in post-meal blood sugar and an increase in insulin resistance. This helps make more energy available for the baby and is an important part of the gestational process. However, in 3-14% of the population (depending on ethnicity), the blood glucose levels raise enough to become a concern. At true diabetic levels, these can be *extremely* harmful to the pregnancy and even the strongest critics recognize this. At borderline levels, however, the level of risk is much more controversial and evidence is strongly contradictory whether treatment improves outcome or introduces its own risks.

Some researchers would like to see universal testing abolished unless more definitive proof of the burden of illness and efficacy of treatment is more clearly established, especially when given the other concerns about the reproducibility and validity of the tests. Other researchers, citing strong concerns over the safety of this approach, advocate maintaining current testing and treatment methods while further studying the issue. The Blank et al. article again offers a good summary:

> *It was concluded that these questions about the sensitivity, specificity, and cost-effectiveness of efforts to diagnose and treat GDM to prevent adverse perinatal effects cannot be resolved without additional carefully designed studies. Accordingly, a group of investigators is currently devising a plan for a new multicenter, multiethnic, and multinational longitudinal study to measure adverse outcomes over time..."What I see as the bottom line is that in this country and some other parts of the world, we've established a standard of care and widespread screening based on imperfect data," said Dr. Coustan [a pioneer of gd research], who is involved in planning the new protocol. "Rather than continue as we are, I think it's appropriate to stop and obtain more data."*

At this time, it is unlikely that the standard of care in regards to testing and treatment will change much while the results of these new studies are awaited. The current standard of care is to test every pregnant woman (or nearly every pregnant woman) for the presence of abnormal glucose tolerance, and to treat even borderline gestational diabetes with protocols similar to regular diabetic pregnancies, complete with fairly high levels of intervention and testing. Whether this is justified is a matter of strong debate and is currently under review, but this standard of care (nearly-universal testing, current cutoffs for diagnosis and treatment, etc.) is likely to remain in place for the foreseeable future.

GD Testing References

TESTING CONDITIONS AND CUTOFFS

Lewis et al, *Prior Feeding Alters the Response to the 50-g Glucose Challenge Test in Pregnancy: the Straub-Traugott Effect Revisited.* Diabetes Care. 16:1551-6. 1993

> *Studies the effect of prior eating on the results of the 50g challenge test and finds that eating prior to testing 'may be of sufficient magnitude to significantly alter the operating characteristics, i.e., sensitivity and specificity, of this test.'*

Cetin M and Cetin A. *Time-Dependent Gestational Diabetes Screening Values.* International Journal of Gynaecology & Obstetrics. 56(3):257-61, 1997 March.

"The time since previous meal affects 50g glucose challenge test results." Advocates new cutoffs based on how long it has been since patient ate previous to the test. [not very practical or likely to be adopted]

Sermer et al. *Impact of Time Since Last Meal on the Gestational Glucose Challenge Test. The Toronto Tri-Hospital Gestational Diabetes Project.* American Journal of Obstetrics and Gynecology. 171(3):607-16, 1994 Sept.

"We suggest that screening strategies for detection of gestational diabetes be reconsidered, to account for the impact of variable postprandial status on the test results." (By having variable threshold cutoffs based on when the patient last ate, the rate of patient misclassification fell from 18% to 13% and the positive predictive value increased from 14% to 18%.)

Diabetes and Pregnancy. ACOG Technical Bulletin 200. Washington, D.C.: American College of Obstetricians and Gynecologists, 1994.

A summary of current recommendations on treatment for pre-existing diabetes and gestational diabetes. A must-read resource.

Landy et al. *Diagnosing Gestational Diabetes Mellitus: Use of a Glucose Screen without Administering the Glucose Tolerance Test.* Obstetrics & Gynecology. 87(3):395-400, 1996 March.

Advocates a cutoff of 185 mg/dl on the one-hour screen as the level at which further testing with the three-hour GTT is not needed. Patients above 185 'have a high probability of gdm and the diagnosis can be made without the GTT. Using this approach could allow prompt initiation of therapy without the inconvenience and discomfort of the GTT.'

Harlass et al. *Reproducibility of the Oral Glucose Tolerance Test in Pregnancy.* American Journal of Obstetrics and Gynecology. 164(2):564-8, 1991.

Tested the reproducibility of the GTT in pregnant women. 22% of women had differing results on the two successive tests, suggesting that about 1 in 5 women would have different results if tested again.

Magee et al. *Influence of Diagnostic Criteria on the Incidence of Gestational Diabetes and Perinatal Morbidity.* Journal of the American Medical Association. 269(5):609-15, 1993 Feb.

Examines the use of NDDG criteria versus the more stringent Coustan and Carpenter criteria. Concludes that the latter criteria deserve wider verification and use, since 50% more cases were found, and these presented nearly as many problems as the women identified with gd under the looser NDDG criteria.

TESTING ALTERNATIVES

Boyd, et al. *Jelly Beans as an Alternative to a Cola Beverage Containing Fifty Grams of Glucose.* American Journal of Obstetrics and Gynecology. 173(6):1889-92, 1995 December.

Found that 18 jelly beans functioned just as well as a 50g glucose cola beverage for a glucose screen; patient tolerance was noted to be greater with the jelly beans.

Shah, et al. *Comparison of Glycohemoglobin Determination and the One-Hour Oral Glucose Screen in the Identification of Gestational Diabetes.* American Journal of Obstetrics and Gynecology. 144(7):774-7, 1982 Dec.

Glycohemoglobin test is not sensitive enough screening tool for the detection of gd, even when used in combination with a 50g challenge screen.

Hughes, et al. *An Evaluation of Fructosamine Estimation in Screening for Gestational Diabetes Mellitus.* Diabetic Medicine. 12(8):708-12, 1995 Aug.

Studied the effectiveness of a second-generation fructosamine estimation test (corrected for total protein). Promotes this as a simpler and more practical test, and suggests a wider evaluation together with a re-evaluation of clinical outcome criteria rather than blood glucose levels alone.

Schwartz, et al. *Use of a More Physiologic Oral Glucose Solution During Screening for Gestational Diabetes Mellitus.* American Journal of Obstetrics & Gynecology. 171(3):685-91, 1994 Sept.

"A more dilute, more palatable oral glucose solution can be used to screen for gestational diabetes mellitus, yielding more accurate results and eliminating unpleasant side effects."

Sacks, et al. *Could the Fasting Plasma Glucose Assay Be Used to Screen for Gestational Diabetes?* Journal of Reproductive Medicine. 37(11):907-9, 1992 Nov.

"We conclude that the fasting plasma glucose assay may perform better than the one-hour post-glucose test as a screening test for gestational diabetes. Based on these data, a population-based prospective study seems justified."

UNIVERSAL SCREENING

Weeks et al. *Gestational Diabetes: Does the Presence of Risk Factors Influence Perinatal Outcome?* American Journal of Obstetrics and Gynecology. 171(4):1003-7, 1994 Oct.

Found that >40% of cases of gd would be missed with selective screening; strongly promotes universal screening.

Naylor, et al. *Selective Screening for Gestational Diabetes Mellitus.* New England Journal of Medicine. 337 (22): 1591, 1997 Nov.

"Consideration of women's clinical characteristics allows efficient selective screening for gestational diabetes." Instead of using universal screening, this study used selective screening (with slightly lower cutoffs) based on risk factors such as age, body-mass index, and race. Overall screening tests performed were reduced by 34%; false positive screenings were reduced from 18% to 15-16%. About 81% of women with gd were detected instead of the 78% detected with usual care.

Helton et al. *Do Low-Risk Prenatal Patients Really Need a Screening Glucose Challenge Test?* Journal of Family Practice. 44(6):556-61, 1997 June.

"We determined that less than 1% of prenatal patients without risk factors for gd were ultimately found to have gd." Selective screening deemed fine for women at low risk; a thorough history is important in determining risk.

Clemenson, N. *Should We Screen for Gestational Diabetes?* [letter; comment] Journal of the American Medical Association. 276(6):451, 1996 Aug 14.

Comments and reply about the debate on universal screening for gd. Notes the lack of consensus, the lack of evidence, and the need for further study for more definitive results.

MISCELLANEOUS

Solomon et al. *Variability in Diagnostic Evaluation and Criteria for Gestational Diabetes.* Diabetes Care. 19 (1):12-6, 1996 Jan.

Examines the consistency of testing and diagnostic criteria among physicians in gd pregnancies and finds wide variations in practice despite National Diabetes Data Group recommendations. Also notes that 25% of women who had taken a GTT and had a physician diagnosis of gd did not officially meet the recommended criteria for diagnosis.

Carr, DB and Gabbe, S. *Gestational Diabetes: Detection, Management, and Implications.* Clinical Diabetes. 16(1):4-24, 1998 Jan. http://www.diabetes.org/clinicaldiabetes/v16n1j-f98/pg4.htm

One of the best overall surveys of gd and its testing and treatment. Very complete overview. Highly recommended for looking at the traditional, conservative view of treating gd.

Tallarigo, et al. *Relation of glucose tolerance to complications of pregnancy in nondiabetic women.* New England Journal of Medicine. 315:989-92, 1986.

Found that 2-hour test results on the GTT correlate significantly with macrosomia.

Weiner, CP*. Effect of Varying Degrees of Normal Glucose Metabolism on Maternal and Perinatal Outcome.* American Journal of Obstetrics and Gynecology. 159:862-70, 1988.

Found that 2-hour test results on the GTT correlate significantly with macrosomia.

Rey, et al. *Carbohydrate Intolerance in Pregnancy: Incidence and Neonatal Outcomes.* Clinical and Investigative Medicine - Medecine Clinique et Experimentale. 19(6):406-15, 1996.

*Found that a GTT with **one** abnormal value still had significant correlation with macrosomia, hypoglycemia, and jaundice.*

Mello, et al. *Risk Factors for Fetal Macrosomia: The Importance of a Positive Oral Glucose Challenge Test.* European Journal of Endocrinology. 137(1):27-33, 1997 July.

Found that a positive 1-hour screen (especially if in the first trimester) was an important risk factor for fetal growth.

Meyer et al. *Early Gestational Glucose Screening and Gestational Diabetes.* Journal of Reproductive Medicine. 41(9):675-9, 1996 Sept.

An early glucose test (first trimester) was found to be justified for patients with specific risk factors such as age or race. Those who have positive screens but negative GTTs early on should be given a repeat test in the third trimester; 16% more cases were diagnosed this way.

Garner, P et al. *A Randomized Controlled Trial of Strict Glycemic Control and Tertiary Level Obstetric Care Versus Routine Obstetric Care in the Management of Gestational Diabetes: A Pilot Study.* American Journal of Obstetrics and Gynecology. 177(1):190-5, July 1997.

*One of the largest truly randomized controlled trials to date that compares no treatment to strict treatment that involved tertiary care and institution of insulin at fastings greater than *80* mg/dl! Also contains an excellent analysis of the previous studies on this subject and their contradictory results; well-worth reading for that alone. Their conclusion was that "this pilot study suggests that intensive treatment of gestational diabetes mellitus may have little effect on birth weight, birth trauma, operative delivery, or neonatal metabolic disorders. It has demonstrated the safety of proceeding to a multicenter trial of sufficient sample size to confirm these findings." The authors emphasize that the sample size (300) was not enough to*

come to any conclusions or recommendations regarding the effect of treatment versus no treatment in gdm, but that the study proved it was safe to proceed to larger-scale testing where a larger sample could be used.

[Back to Kmom Area]